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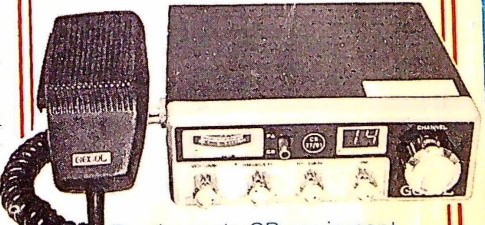

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OVER 10,000 SUBSCRIPTIONS IN SIX WEEKS

We'd like to take this opportunity to say thanks to all of you who gave us your overwhelming vote of confidence in the new magazine. Over ten thousand of you in the first few weeks!

It is, of course, excellent value for money. In this issue alone we feature four projects, each one of which would probably have been a front cover article in the monthly electronics magazines — and the longer ones would have been spread over two months or more.

Another great advantage with building our projects is that we make available the PCB's and front panels — so that the finished project can look as nice as a factory made one. Also this time you'll note that we've made ordering easy for you by making available a complete kit of each section of each project. So now you no longer need to order long lists of components, just one number orders the whole kit for you.

Selling in this way also keeps down our costs and we've passed the saving on to you. In some cases, the kit prices are many pounds cheaper than buying all the parts separately. The details of the kits are at the end of each parts list.

In this issue we also have the first of our sets of special offers. The three in this issue alone will save you nearly £30! over previous selling prices. And we promise you many more like these in the months to come.

Perhaps the most amazing offer this time is the CB set featured on the front cover. A full £30 cheaper than equivalent sets in the shops at the moment. We are importing these directly in order to make the saving and each one will be individually tested in our laboratory before it is despatched to you. We have also introduced a whole range of CB equipment to complement our new rig, so now you can get all you need from Maplin.

We're already working on issues three and four and we've got lots of exciting and interesting projects and bargains lined up for you. The Maplin Magazine is essential reading for all electronics and computer enthusiasts. Don't miss it — place your subscription now.

Cover Picture

The superb colour photograph by W. Sharman shows the 80135 leaving Levisham with the 09:50 from Grosmont for Pickering. Our thanks to Mr Sharman for his permission to use that photograph and the ones in the Train Controller article.

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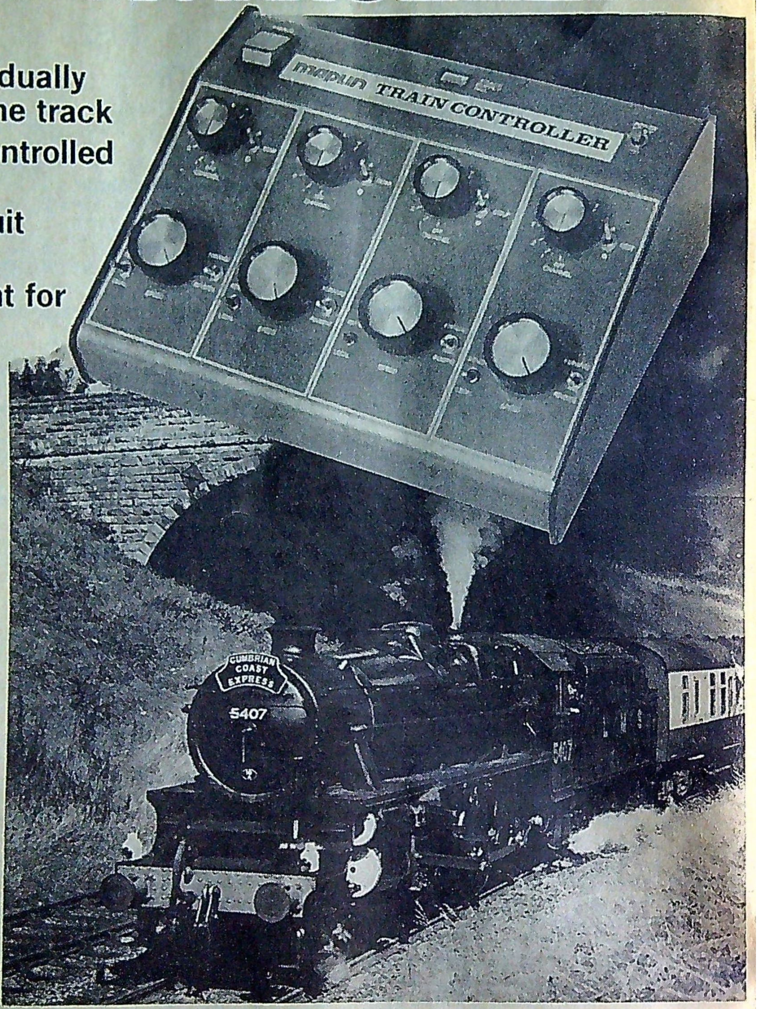
DIGITAL MULTI-TRAIN CONTROLLER

by Robert Kirsch

- ★ **14 locomotives individually controlled on the same track**
- ★ **Any 4 locomotives controlled simultaneously**
- ★ **Automatic short circuit protection**
- ★ **Supply always present for carriage lighting etc.**
- ★ **Remote control and computer interfacing**
- ★ **Low cost, two wire system**



Railway enthusiasts have for many years appreciated the need for a control system that enables trains to be driven as if the operator were in the driving cab of the locomotive. This not only means control of speed and direction of that locomotive, but also the ability to move anywhere on the layout without the need for track isolating or switching, thus making the wiring of the layout much simpler.

The system described in this article fulfills all these needs by producing a constant 18V DC on the track with digital information superimposed on it, to which only the selected train or trains will respond. The permanent track voltage also means that locomotive headlights, carriage lighting and many accessories may be used unaffected by the speed of the trains.

This system can control up to 14 locomotives all on the same track, and any four of these may be driven independently at one time. Provision is also made for any or all, of the four control units to be operated by a 7 bit digital input, thus enabling remote control either from hand-held units (using wire or radio) or from a home computer, giving full control of direction and speed.

Details of the remote control and computer interfacing will be described in later articles.

Circuit Description

Refer to Figures 1 to 5 when following the circuit description.

The most important consideration in the design of a system like this is to keep the receiver module as small as practible to enable it to fit in as many locomotives as possible. This has been achieved by using a small 8 pin IC, the ML926/7, IC1 as the receiver. Decoding and control is accomplished by IC2, a 40106 CMOS IC leaving two transistors, TR2 and TR3 as input amplifiers, the six transistors TR4 to TR9 for motor control and one transistor, TR1 as a voltage stabiliser.

The ML926 and ML927 are pulse position modulation (PPM) receivers with built-in error detection circuits. There are four outputs from each IC, three of which are decoded by IC2 to control one of the seven receivers. (000 is used as the all off condition.) The fourth output is used to control the direction of travel. A fifth bit is transmitted by the control unit to select either the ML926 or the ML927 ICs, thus giving fourteen channels.

As it is only possible to decode one signal at a time the receiver is addressed for one period out of four (called its time slot) and it retains the information received until the next address is due.

The speed of a locomotive is controlled by allowing any number of coded time slots (from 1 to 10) to be transmitted during a period of 10 time slots (TS), thus controlling the on to off ratio of pulses fed to the motor. Minimum speed is with one TS pulse and nine

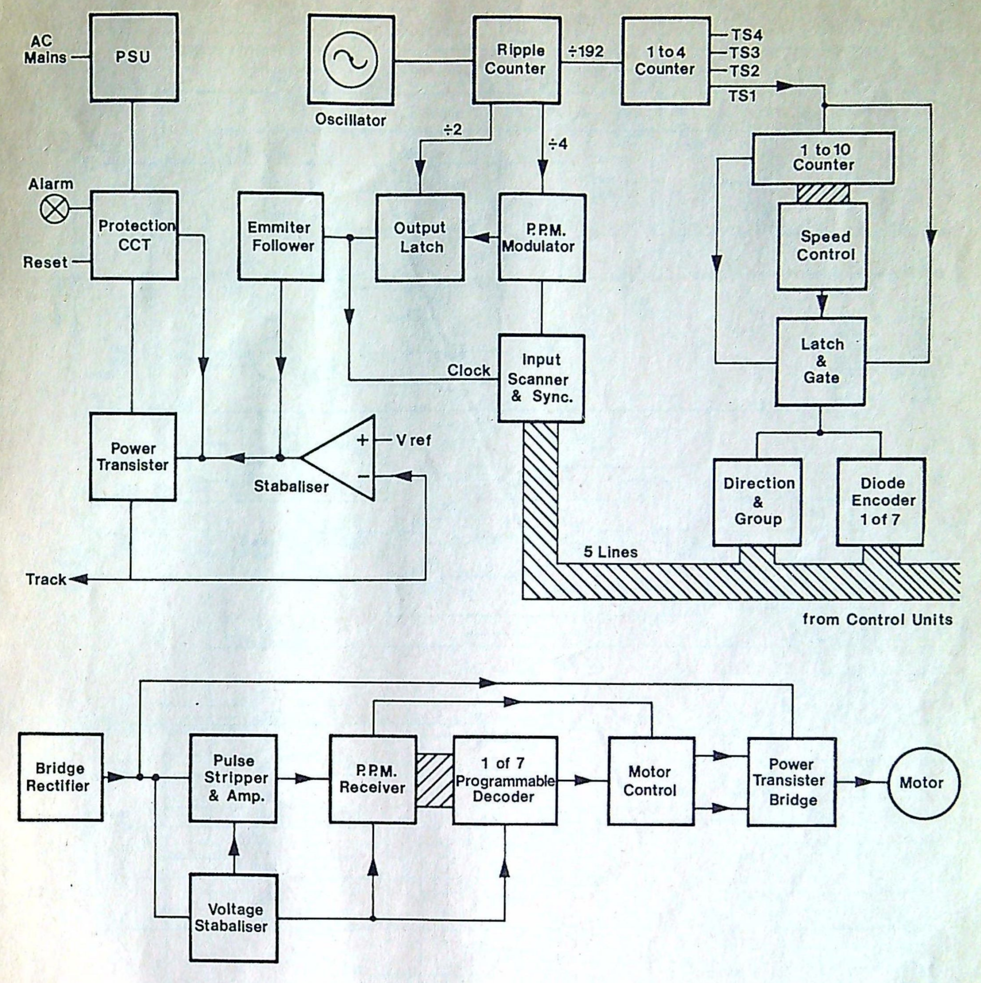


Figure 1. Block diagram. (a) Common and control boards. (b) Receiver.

blank periods, half speed is with five TS pulses and five blank periods and full speed is with a continuous string of TS pulses being sent thus keeping the motor driven at full power.

The transmitter IC normally used with the ML926/7 is the SL490 but several of the built in features of that IC make it undesirable to use in this application.

The PPM system uses a frame of six pulses followed by a sync period. Digital information is transmitted by varying the time between two consecutive pulses in the following ratio: DATA 1 = 2, DATA 0 = 3, SYNC = 6.

The pulse timing is controlled by resetting a counter IC4 after 2, 3 or 6 clock pulses have been received depending on whether the data to be sent is 1, 0 or sync. In order to transmit each one of the five data bits in their correct order another counter, IC8 scans the five AND gates IC3c and IC7 in turn and then at the sixth count causes the sync period to be sent at the same time resetting the counter for the next scan. The timing point of the pulse to be transmitted is detected by monitoring the resetting point of this counter. This causes the latch IC3d to be triggered which allows a pulse of twice the clock period to be sent.

The ripple counter, IC5 provides all timing pulses required by the controller. It is fed by the CMOS relaxation oscillator formed by IC6 a,b,c and d. This oscillator is divided by 192 by IC5 to produce a TS trigger pulse approximately every 850us. Each frame of data takes about 380us, so that two complete frames can be sent in one TS period.

The trigger pulse denoted above is used to clock the counter IC9 and produce four separate, consecutive output pulses, TS1-4 each approximately 850us long. Each of the four control boards is fed with one of these TS pulses and this pulse is used to step the counter IC1 (control board). The counter steps from one to ten and then resets itself for the next count. The first output from the counter sets the latch IC2b and c which is reset when the counter reaches the number set by the speed control thus holding the latch open for one to ten pulses. The latch gates TS pulses which are fed to the diode encoder. The pulses are connected onto one or more of the three data lines depending on the code of the receiver being addressed. If the reverse switch is operated or group 2 is selected the TS pulse is switched onto the appropriate data lines.

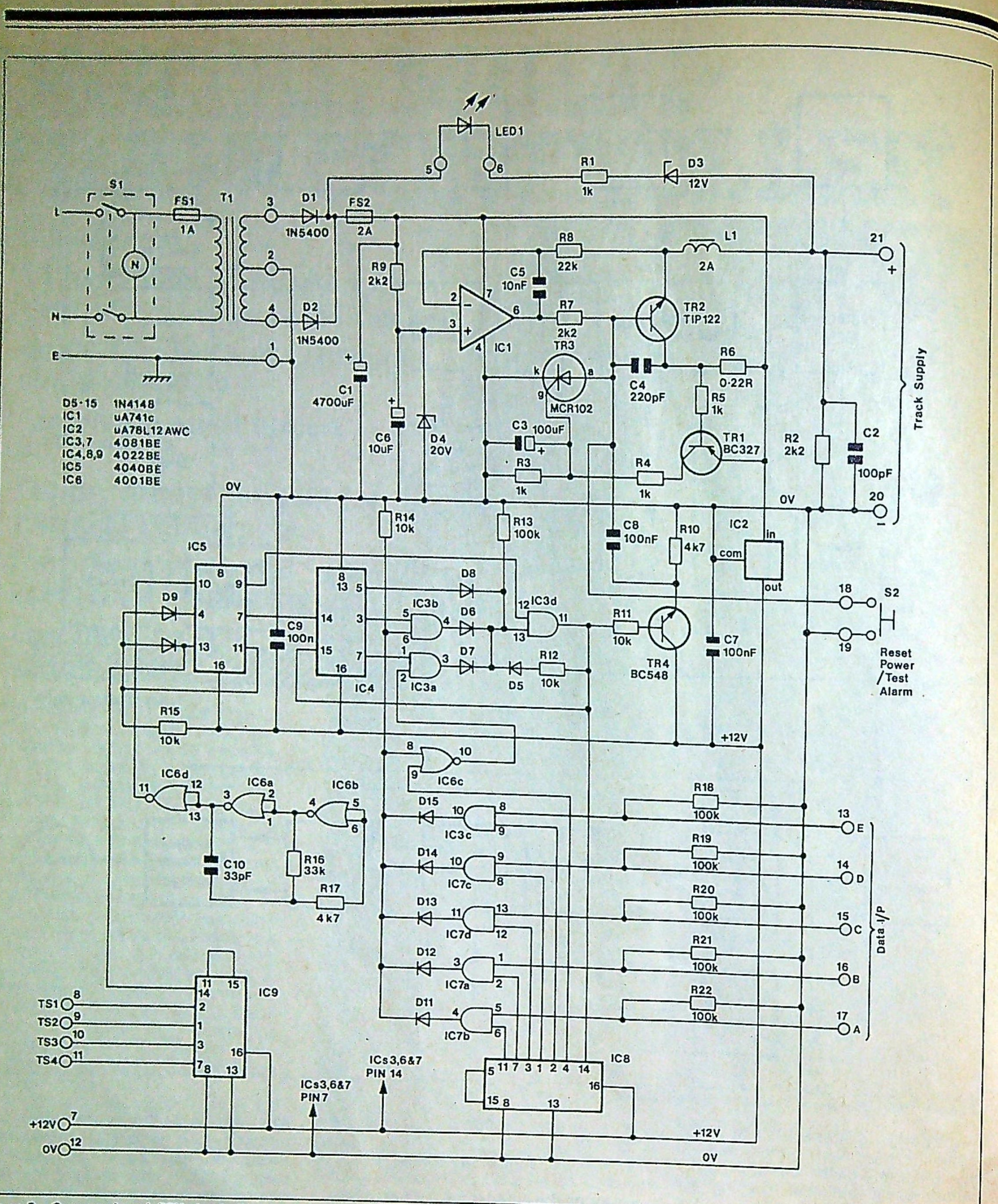
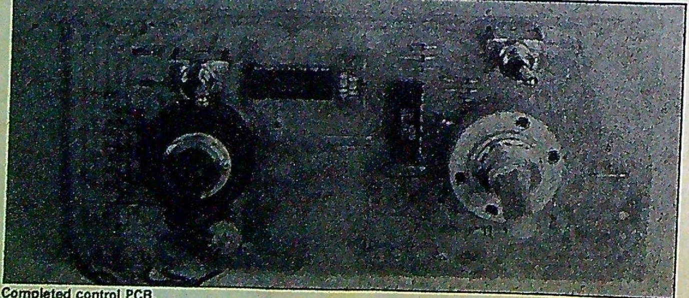


Figure 2. Common board. PSU circuit diagram.



Completed control PCB.

The DC supply fed to the track is stabilised by IC1 (common board) at about 18V and data signals from the emmiter follower TR4 are superimposed on it and used to control the power Darlington transistor, TR8 which supplies current to the track. In order to protect the controller from damage due to accidental short circuiting of the track the current flowing through R6 is monitored by TR1. When this current exceeds the preset limit the transistor conducts and fires the SCR TR3 thus removing the drive to TR2 and turning off the supply to the track.

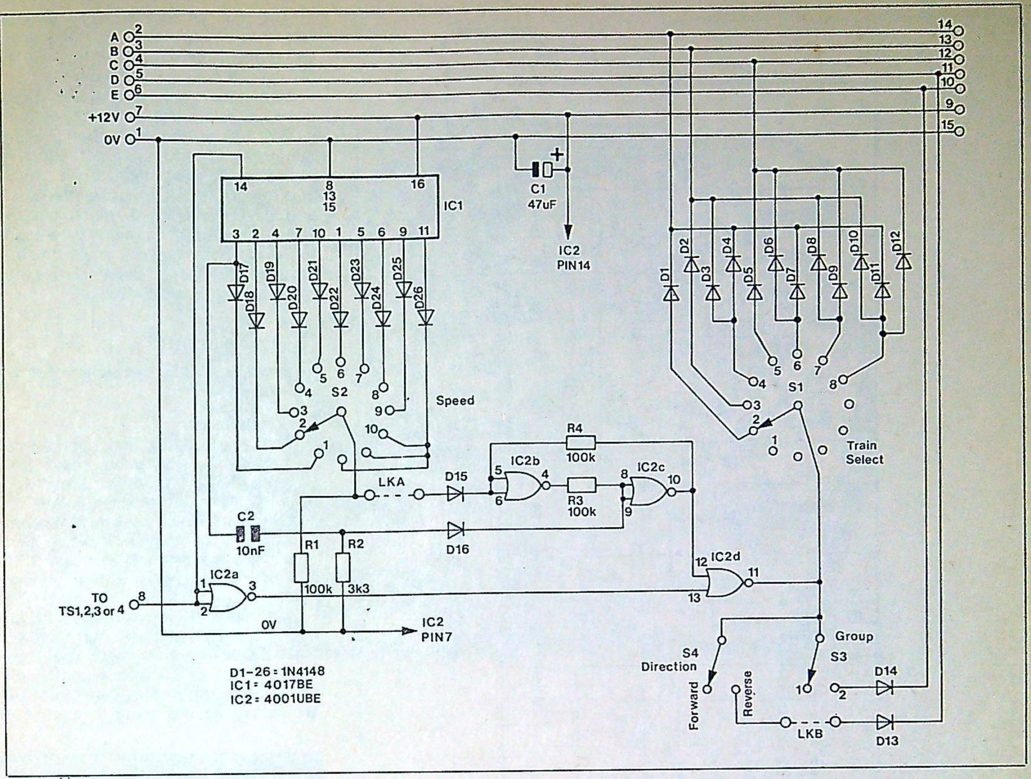


Figure 3. Control board circuit diagram.

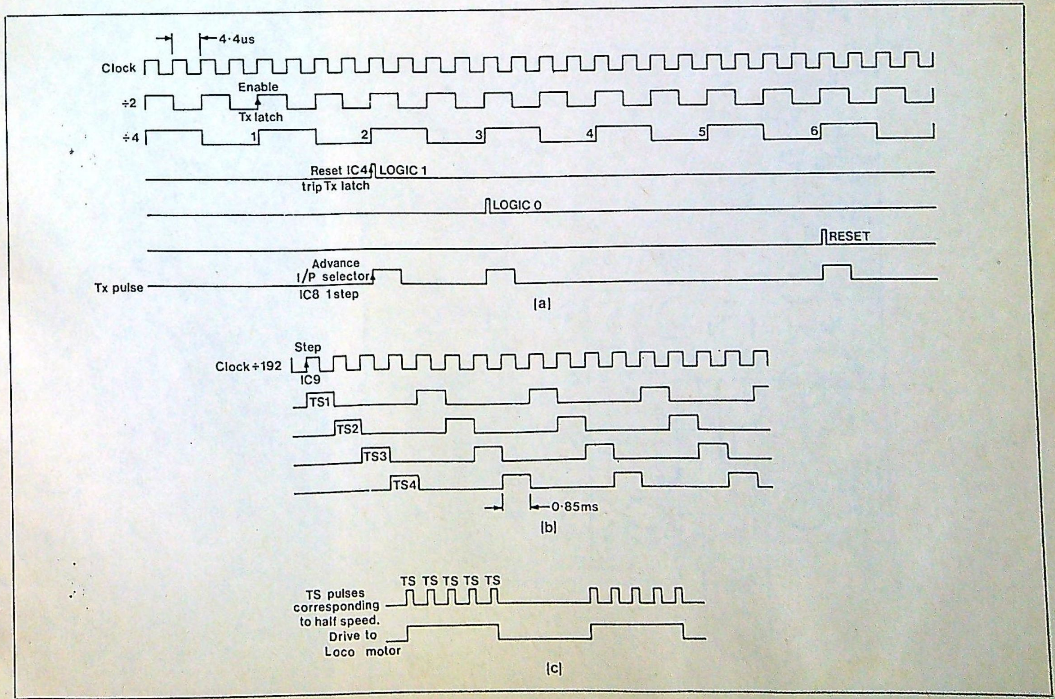


Figure 4. Timing diagram.

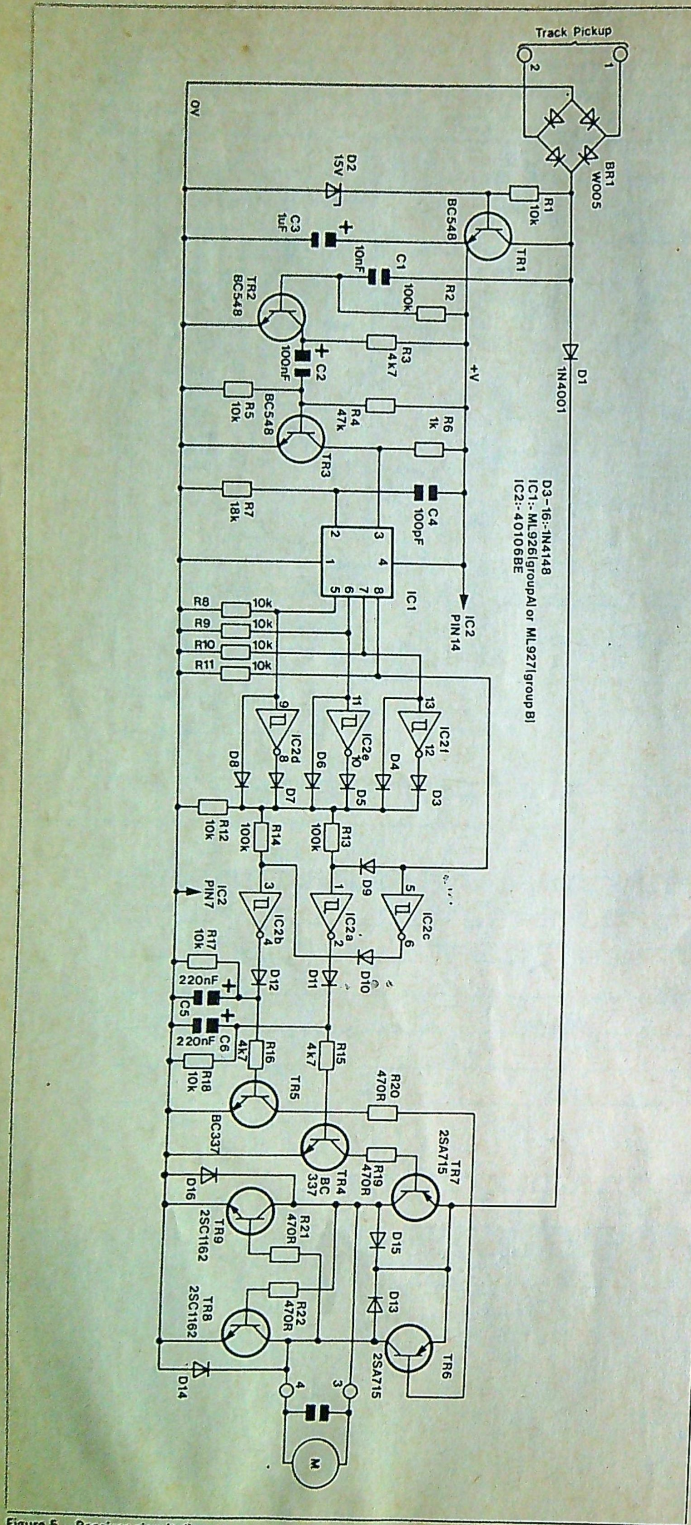


Figure 5. Receiver circuit diagram.

The SCR remains latched until it is reset by shorting it with S2. If the fault is still present the circuit will trip immediately and cause no damage.

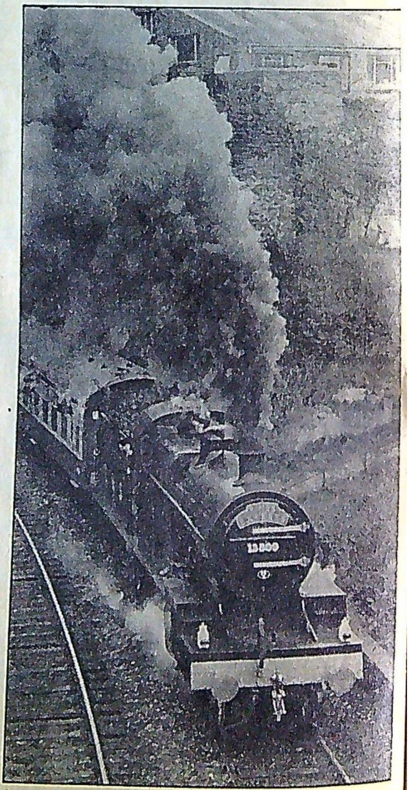
When the track supply falls more than 12V below the power units output, either due to the protection circuit being tripped or due to a fuse failure the indicator LED1 will light. Provision is also made for a buzzer to be fitted if an audible indication of track supply failure is required. A timer may be used to reset the protection circuit automatically after a short delay and this will be described in a later article.

Construction

Build all PCBs referring to legends and parts list.

Common Board

The track layout and component overlay for the common board are shown in Figure 6. Fit Veropins and PCB mounting fuse holders and solder. Insert and solder all resistors, diodes, capacitors and the choke. Insert the two plastic transistors, regulator and SCR into their correct positions. Push the leads of the power transistor TR2 through the PCB just far enough to allow it to be soldered and bend the leads as shown in Figure 7. Finally, insert and solder all ICs observing the usual CMOS precautions and making sure that they are the correct way round.



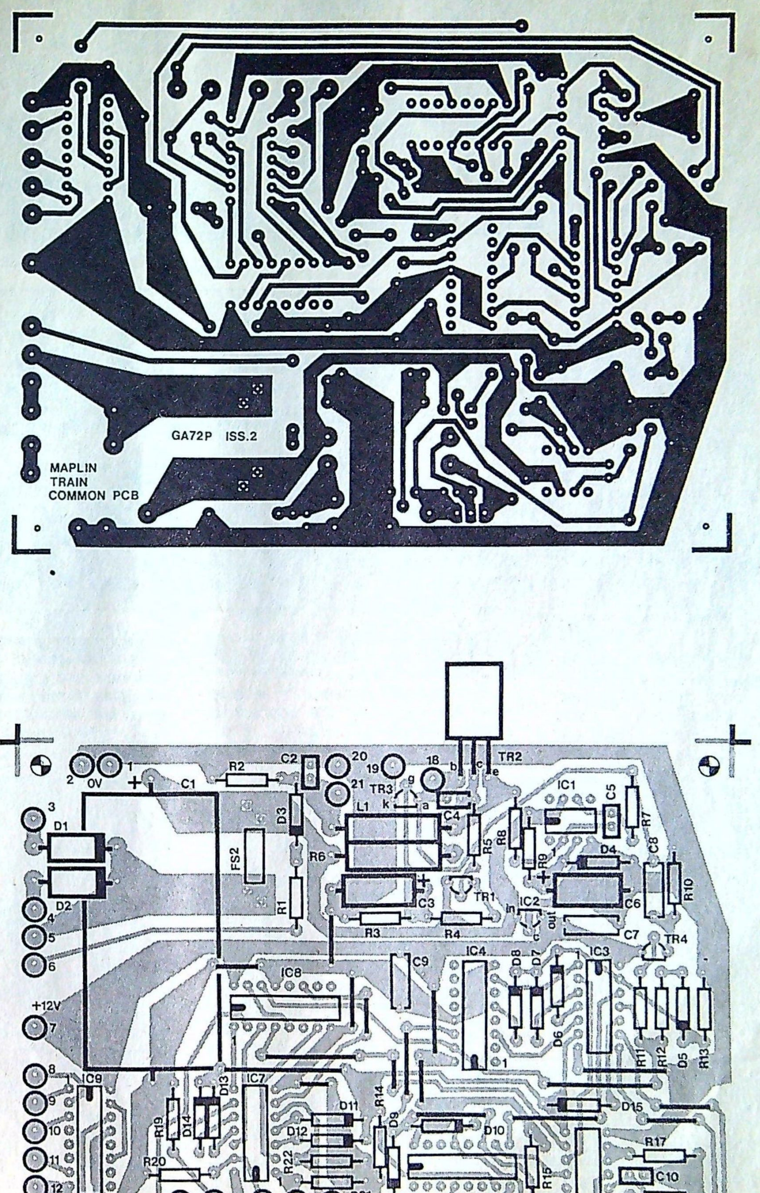
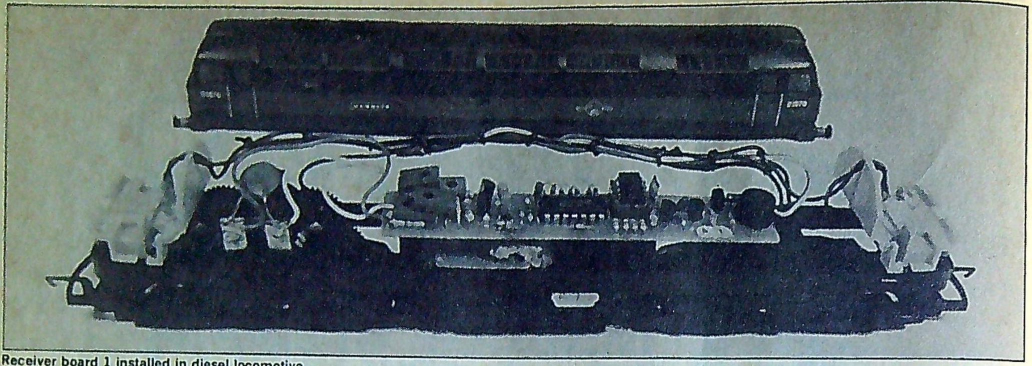
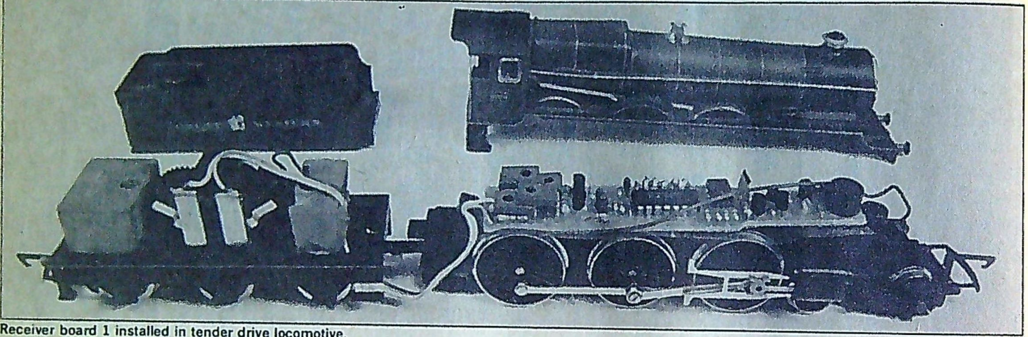


Figure 6. Common board track layout component overlay.



Receiver board 1 installed in diesel locomotive.



Receiver board 1 installed in tender drive locomotive.

Control Board

The track layout and component overlay for the Control Board are shown in Figure 8. Fit and solder all components in order as described above but in this case fit the Veropins from the component side of the PCB to enable ease of wiring when the boards are fitted to the front panel. The rotary switch without the click stops is mounted next to IC1. Note the unused component positions on the board are for the remote control option which may be added later.

Assembly

Mount the transformer, mains switch, fuse holder, LED, push button and terminals on the case. Fit the common board and control boards. (Note that only one control board need be fitted initially.) The self-adhesive penal legend may be used as a template for drilling the front panel or the ready drilled case XG09K may be used. Note that this is not included in the kit.

Wire all boards and components together referring to Figure 13. Insert the fuses noting that the 1 amp anti-surge fuse is fitted in the panel fuse holder.

Receiver board

There are initially two receiver boards available to fit varying size locomotives. See Figures 10 and 11. The dimensions of these boards are shown in Figure 9. Fit and solder all capacitors and resistors noting that some resistors do not lay flat on the board. Insert and solder all diodes other than D3 to D8 and fit all transistors taking special care with the positioning of TR6, 7, 8 and 9 as shown in Figure 10b/11b. Insert and solder IC2.

Decide which channel the receiver is to use and insert the appropriate diodes referring to Figure 12. If the receiver is to be group A then insert an ML926, if group B an ML927. Carefully check all soldering and positioning of components before testing.

Testing Procedure

Controller

Switch on power with nothing connected to the output terminals. The neon indicator in the mains switch should now be illuminated. Using a meter set to 20V DC or above check that there is approximately 18V at the output terminals.

Press the reset button and the "Track Supply Fail" LED should light and extinguish when the button is released. If this test is satisfactory, short circuit the output terminals and the LED should again light brightly while the short circuit is present and dimly when the short circuit is removed. Press the reset button. The LED should be extinguished and 18V restored to output terminals.

Receiver

Connect the receiver to the control unit as shown in Figure 14. Select the channel number and group of the receiver on a control unit and advance the speed control. One of the two lamps should light with its brightness depending upon the speed set. Switch over the reverse switch to the opposite position and repeat the test. In this case the other lamp should respond. Switch the control unit to the other channels and groups and ensure that the lights remain extinguished. If these tests are satisfactory the module is ready to be inserted in the locomotive.

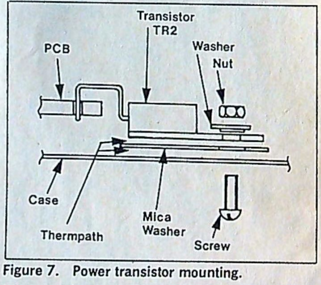


Figure 7. Power transistor mounting.

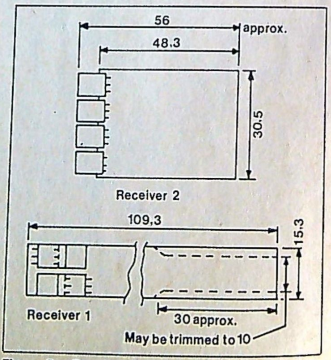


Figure 9. Receiver board dimensions.

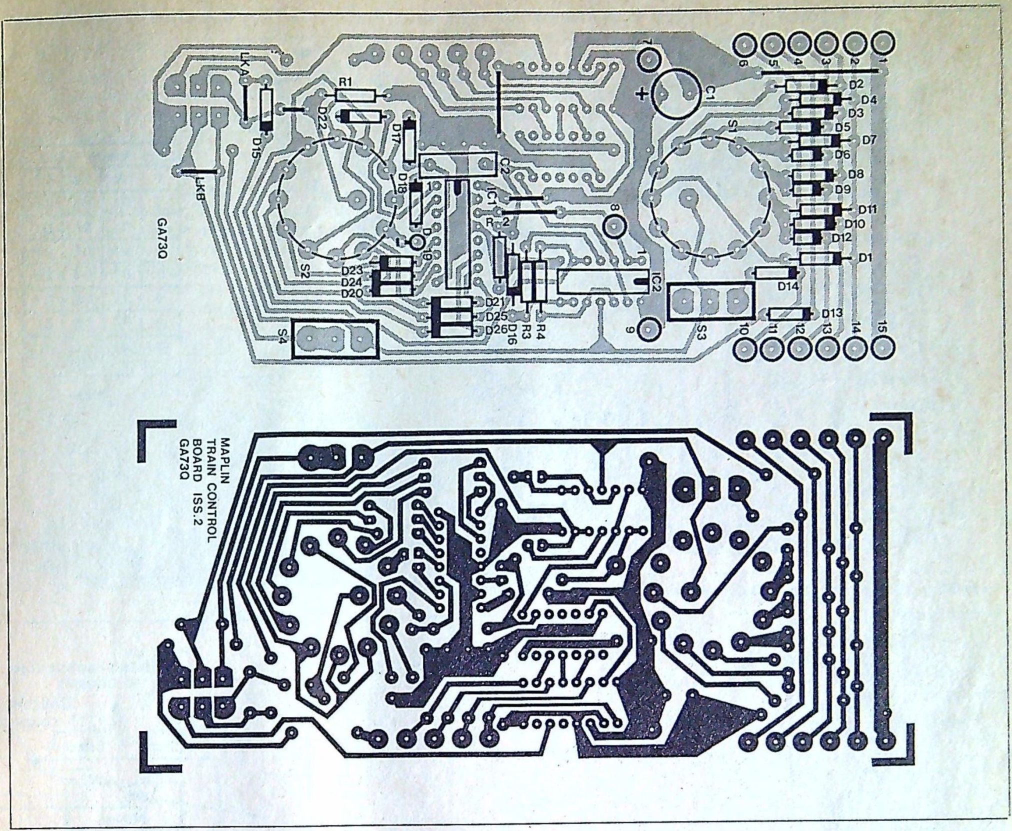
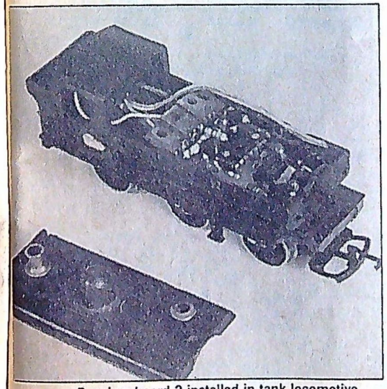
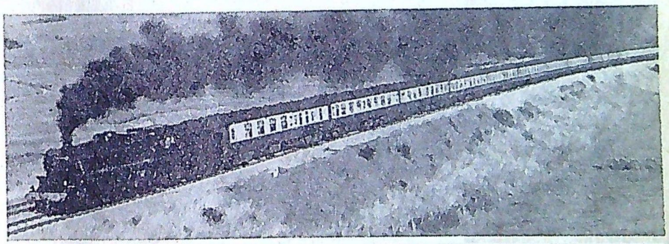


Figure 8. Control board track layout component overlay.



Receiver board 2 installed in tank locomotive.



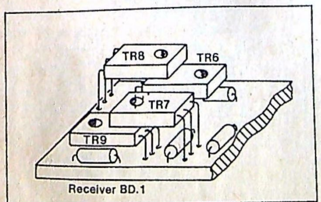


Figure 10(b). Receiver board 1 transistor mounting.

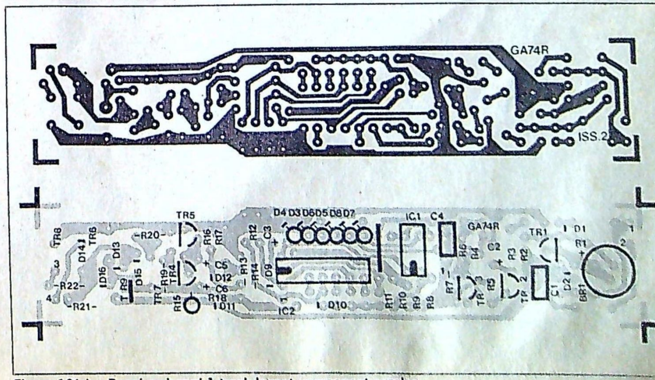


Figure 10(a). Receiver board 1 track layout component overlay.

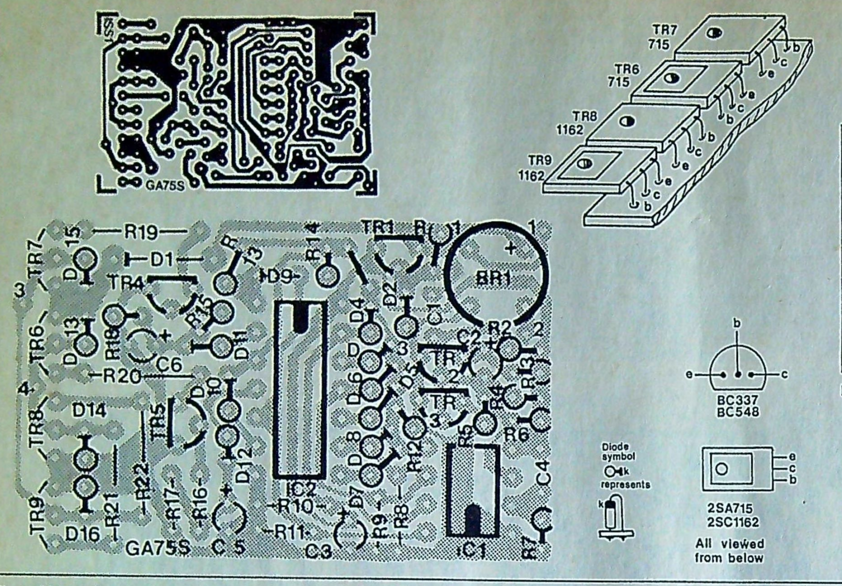


Figure 11(a). Receiver board 2 track layout component overlay. (b). Receiver board 2 transistor mounting.

Loco	Insert Diode		
1	D4	D6	D7
2	D4	D5	D8
3	D4	D5	D7
4	D3	D6	D8
5	D3	D6	D7
6	D3	D5	D8
7	D3	D5	D7
Group A ML926		Group B ML927	

Figure 12. Receiver code chart.

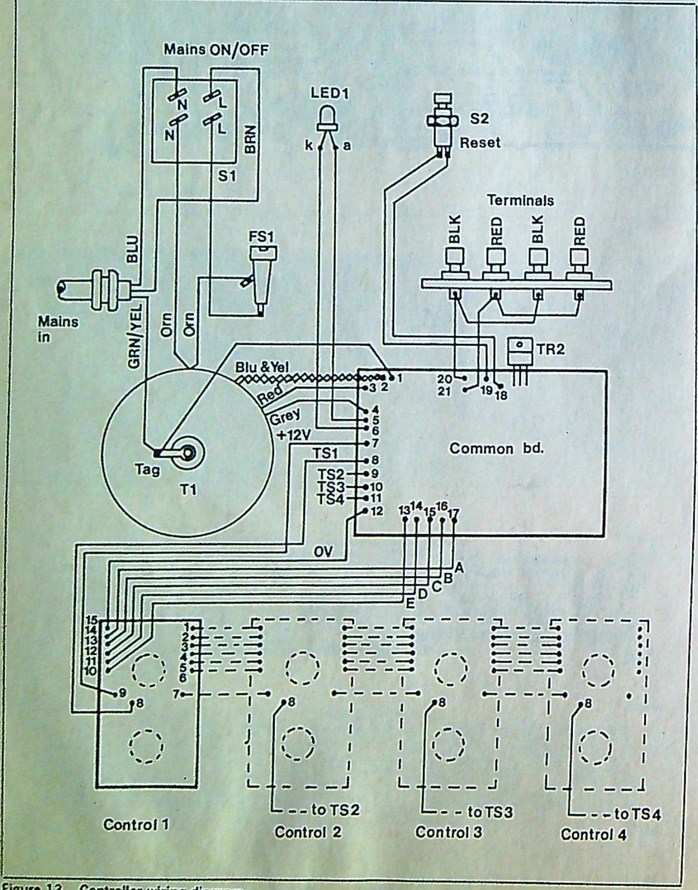


Figure 13. Controller wiring diagram.

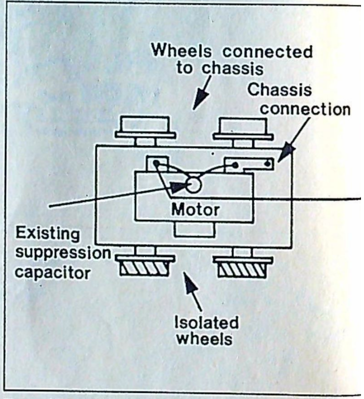


Figure 15. Wiring of conventional locomotive.

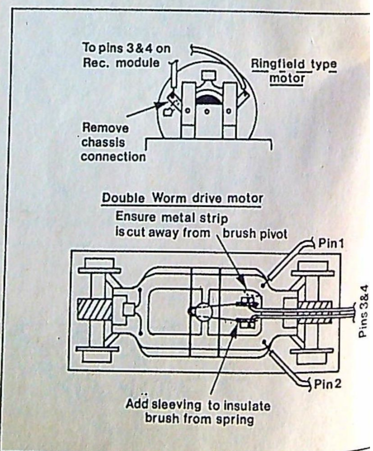
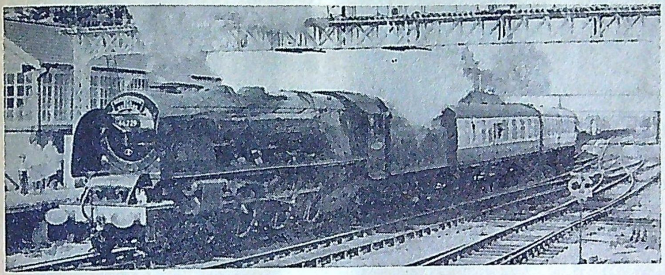

To pins 3&4 on Rec. module
Ringfield type motor
Remove chassis connection
Double Worm drive motor
Ensure metal strip is cut away from brush pivot
Pin1
Pins 3&4
Pin2
Add sleeving to insulate brush from spring

Figure 16. Modifications to various motors.

Installing Receivers in Locomotives

All locomotives designed for use with conventional control systems have the two sides of the motor connected directly to the wheels on each side of the locomotive Figure 15. To install the receiver module, the motor must be completely isolated from the wheels. In many modern models this is accomplished by removing a wire link but in some of the older models there is a permanent connection from one side of the motor to the chassis. In all cases by careful modification this connection can be removed. Some examples are shown in Figure 16. It is most important to ensure that the motor is completely isolated and it is worth checking this with a meter set to ohms before installing the module.

In most cases there will be a wire coming from one of the pickups, this is connected to one input of the module and the other input is connected to the chassis at a suitable point as shown in Figure 17. After installation, if it is found that the locomotive travels in the wrong direction in relation to the controller switch, the wires to the motor should be reversed.



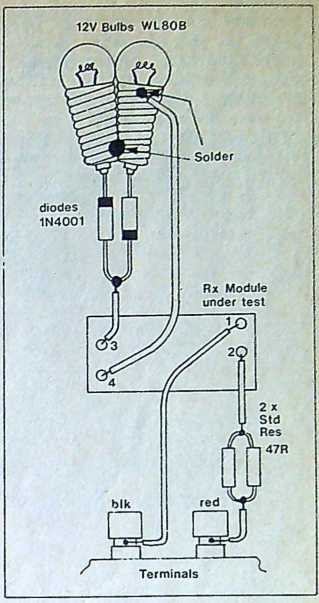
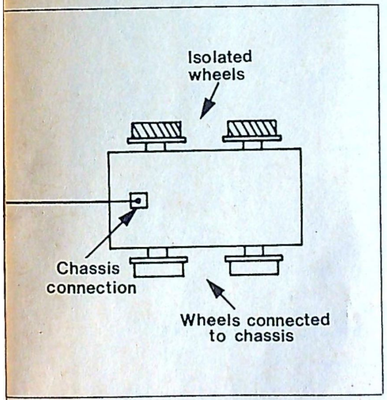
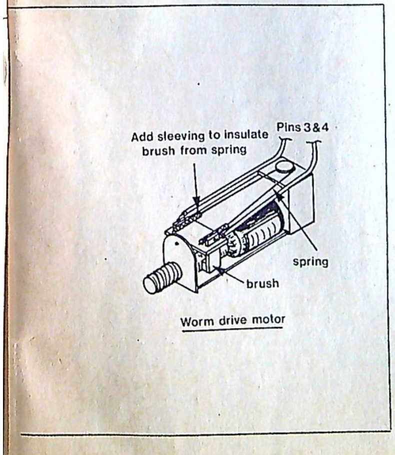


Figure 14. Receiver testing.





KIT PRICES

Complete kits are available for the train controller as follows:

All parts in Train Common/PSU Parts List excluding the case (XG09K).
Order As LW61R (Train Common/PSU Kit)
Price £27.50

All parts in Train Control Parts List
Order As LW62S (Train Control Kit) Price £6.45

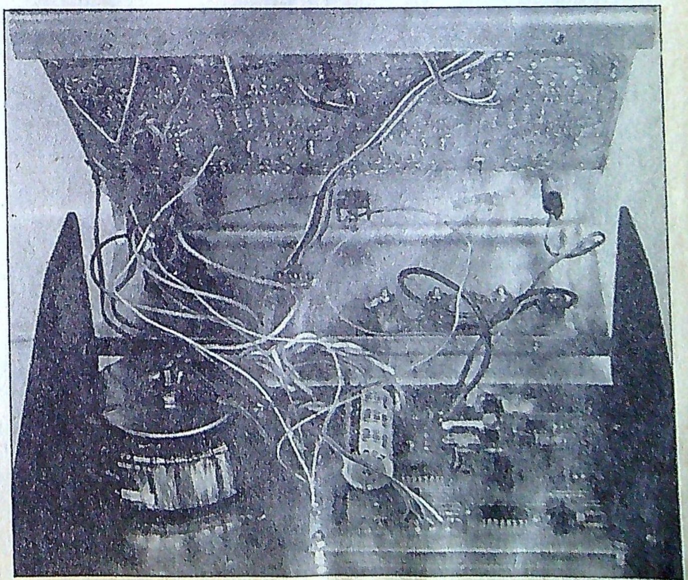
Four kits are available to make receiver modules as follows:

Kit for Group A with long PCB
Order As LW63T (Receiver 1-ML926 Kit)
Price £5.95

Kit for Group A with square PCB
Order As LW64U (Receiver 2-ML926 Kit)
Price £5.95

Kit for Group B with long PCB
Order As LW68Y (Receiver 1-ML927 Kit)
Price £5.95

Kit for Group B with square PCB
Order As LW69A (Receiver 2-ML927 Kit)
Price £5.95



Internal view of main control box.

To ensure reliable operation of this system, as with any other, the locomotives should be in good condition, and it is often worth replacing brushes and cleaning wheels and pickups before use. The track needs to be kept fairly clean although the receiver will respond to signals as long as there is enough power to drive the motor.

The next article in this series will describe the remote control facilities and computer interfacing.

Future articles will describe track circuiting (train position detection) point control and detection of position, interlocking and control of signals, automatic loop switching, and many other useful circuits as well as constructional hints for the railway modeller. ■

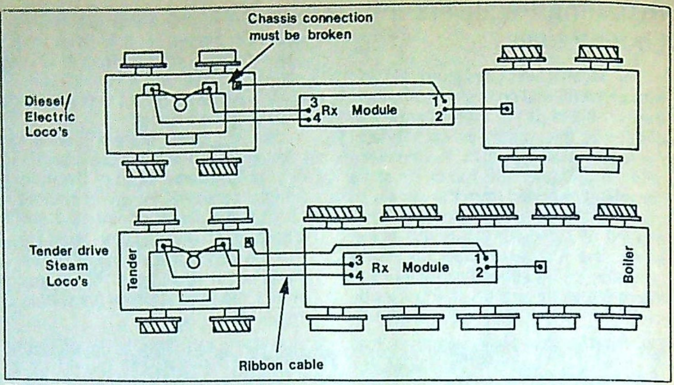


Figure 17. Installation of receiver in locomotive.

TRAIN CONTROL PCB PARTS LIST

Resistors — all ⅓W 5% carbon unless specified			
R1,3,4	100k	3 off	(M100K)
R2	3k3		(M3K3)
Capacitors			
C1	47uF 25V PC elect.		(FF08J)
C2	10nF polyester		(BX70M)
Semiconductors			
D1-26	1N4148	26 off	(QL80B)
IC1	4017BE		(QX09K)
IC2	4001UBE		(QL03D)
Miscellaneous			
S1	Rotary switch 1 pole 12 way		(FF73Q)
S2	Rotary switch 1 pole 12 way special		(XX45Y)
S3,4	Sub-min toggle 'A'	2 off	(FH00A)
	Veropin 2141	15 off	(FL21X)
	Train control PCB		(GA73Q)
	Knob K7B (for S1)		(YX02C)
	Knob K7C (for S2)		(YX03D)
	Train control front panel		(XX47B)

TRAIN COMMON/PSU PARTS LIST

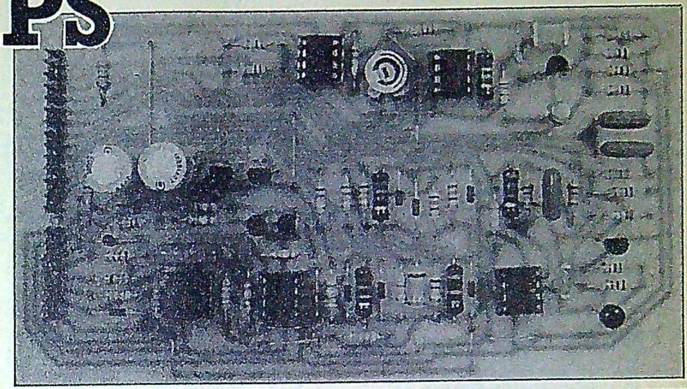
Resistors — all ⅓W 5% carbon unless specified			
R1,3,4,5	1k	4 off	(M1K)
R2,7,9	2k2	3 off	(M2K2)
R6	0.22R (3W) wirewound		(W0.22)
R8	22k		(M22K)
R10,17	4k7	2 off	(M4K7)
R11,12,14,15	10k	4 off	(M10K)
R13,18-22	100k	6 off	(M100K)
R16	33k		(M33K)
Capacitors			
C1	4700uF 25V axial electrolytic		(FB96E)
C2	100pF ceramic		(WX56L)
C3	100uF 10V axial electrolytic		(FB48C)
C4	220pF ceramic		(WX60Q)
C5	10nF ceramic		(WX77J)
C6	10uF 25V axial electrolytic		(FB22Y)
C7,8,9	100nF polyester	3 off	(BX76H)
C10	33pF ceramic		(WX50E)
Semiconductors			
D1,2	1N5400	2 off	(QL81C)
D3	BZX61C12		(QF55K)
D4	BZY88C20		(QH21X)
D5-15	1N4148	11 off	(QL80B)
TR1	BC327		(QB66W)
TR2	TIP122		(WQ73Q)
TR3	MCR102		(QH43W)
TR4	BC548		(QB73Q)
IC1	uA741C (8-pin)		(QL22Y)
IC2	uA78L12 AWC		(WQ77J)
IC3,7	4081BE	2 off	(QW48C)
IC4,8,9	4022BE	3 off	(QW19V)
IC5	4040BE		(QW27E)
IC6	4001BE		(QX01B)
Miscellaneous			
L1	RF suppressor choke 2A		(HW05F)
T1	Torodial transformer 80VA 18V		(YK17T)
LED 1	LED red		(WL27E)
FS1	Fuse anti-surge 1A		(WR19V)
FS2	Fuse 20mm 2A		(WR05F)
S1	Dual rocker neon		(YR70M)
S2	Push switch		(FH59P)
	Safe fuseholder 20		(RX96E)
	Fuse clip	2 off	(WH49D)
	S/R grommet		(LR49D)
	Veropin 2141	21 off	(FL21X)
	LED clip		(YY40T)
	Quickterm push		(BW71N)
	Train common PCB		(GA72P)
	Mains lead	3M	(XR04E)
	10-way ribbon cable	1M	(XR06G)
	Wire 3202 black	1M	(XR32K)
	Wire 3202 red	1M	(XR36P)
	Train control case		(XG09K)
	Kit 'P' plas		(WR23A)
	Bolt 6BA x ½"	7 off	(BF06G)
	Washer 6BA	3 off	(BF22Y)
	Spacer 6BA x ⅛"	4 off	(FW33L)
	Nut 6BA	7 off	(BF18U)
	Tag 2BA		(BF27E)
	Small thermpath		(HQ00A)
	Train control front panel		(XX47B)
	Stick-on feet		(FW38R)

TRAIN RECEIVER MODULE PARTS LIST

Resistors — all ⅓W 5% carbon unless specified			
R1,5,8-12,17,18	10k	9 off	(U10K)
R2,13,14	100k	3 off	(U100K)
R3,15,16	4k7	3 off	(U4K7)
R4	47k		(U47K)
R6	1k		(U1K)
R7	18k		(M18K)
R19-22	470R	4 off	(S470R)
Capacitors			
C1	10,000pF ceramic		(WX77J)
C2	100nF 35V tantalum		(WW54J)
C3	1uF 35V tantalum		(WW60Q)
C4	100pF ceramic		(WX56L)
C5,6	220nF 35V tantalum		(WW56L)
Semiconductors			
D1	1N4001		(QL73Q)
D2	BZY88C15V		(QH18U)
D3-16	1N4148	14 off	(QL80B)
BR1	W005		(QL37S)
IC1	ML926 (Group 'A')		(QR57M)
or	ML927 (Group 'B')		(QR58N)
IC2	40106BE		(QW64U)
TR1-3	BC548	3 off	(QB73Q)
TR4,5	BC337	2 off	(QB68Y)
TR6,7	2SA715	2 off	(QR56L)
TR8,9	2SC1162	2 off	(QR59P)
Miscellaneous			
	Train receiver 1 PCB		(GA74R)
or	Train receiver 2 PCB		(GA75S)

Details of kits are given on page 11

WORKING WITH OP~AMPS



by Graham Dixey
C.Eng., M.I.E.R.E.

Not many years ago the OP-AMP was an expensive and specialised device. To give it its full title of 'operational amplifier' is to emphasise that its original role was to perform mathematical operations. It was the active component of the analogue computer, which largely appears to have taken a back seat these days.

The reason for the current popularity of the operational amplifier (or op-amp) is its cheapness and versatility in the form in which it is now to be found; that is as a monolithic integrated circuit. Of course, it can still be used for its original applications such as integration, differentiation, addition, subtraction, etc., but generally the field of application is much wider. It is used in purely linear fishion e.g. in audio amplifiers and instrumentation amplifiers, but it can also be used in pulse circuits and various other more exotic guises.

In this article, some of the op-amps uses in a variety of roles will be examined and will assume the reader has little previous knowledge of either the electronics or mathematics involved. Examples of circuit design will be presented along with the necessary theory.

The Ideal Op-Amp

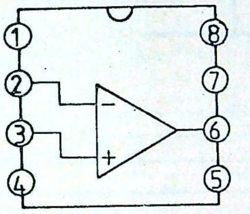
In electronics it is frequently necessary to make sensible approximations in order to present a particular topic intelligibly. It is amazing how very complex and unwieldy formulae often become quite simple when some sort of approximation is made. This is certainly true of op-amps and the resulting formulae are then very readily applied to practical situations. Listing the main features of an ideal op-amp gives us:

(a) infinite gain
(b) infinite input impedance
(c) zero output impedance
(d) infinite bandwidth

This looks a very formidable specification at first sight. Of course, we cannot actually expect to realise these parameters, but the real values are relatively close enough to have little practical significance. For example, a typical voltage gain A might be 200000 which is a lot less than infinity, but if we compare A with A + 1 the difference is insignificant. It is this sort of comparison that allows us to make worthwhile simplifications.

Enter the 741

I decided to base this article on one particular chip, the 741, for several reasons; it is very cheap (about 22½p), easily obtainable and does not need a host of compensating components in order to make it work. It also has a short-circuit proof output. There are other op-amps that can outperform it in one way or another but it will serve well enough to introduce the basic principles of op-amps and their applications.



1 Offset Null
2 Inverting Input
3 Non-Inverting Input
4 - V
5 Offset Null
6 Output
7 + V
8 N.C.

Figure 1. Pin-out diagram of the uA741CP op-amp.

Figure 1 shows the pin-out diagram for the 8-pin version (there is also a 14-pin version), from which we see that the connections fall into three groups, according to function:

(a) power supplies +V and -V
(b) offset-null terminals
(c) inputs and output

Input and Output

There are two inputs and one output and the usual symbol showing these terminals appears in Figure 2. The input marked with a - sign is known as the 'inverting input' (180° phase-shift between this input and the output); the input marked with a + sign is known as the 'non-inverting input' (0° phase-shift between this input and the output). Figure 3 illustrates the action of each input considered separately, the other input then being taken to 0V.

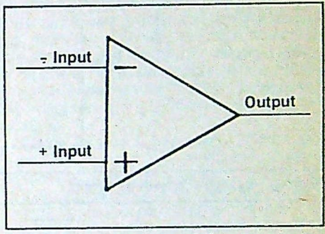


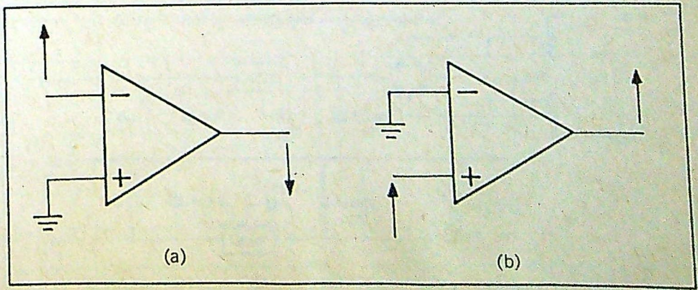
Figure 2. Basic op-amp symbol.

The arrows are used to represent signals in a general manner e.g. the 'up-arrow' can signify the positive half-cycle of a sine-wave, a positive DC level, a positive ramp etc. Similarly the 'down-arrow' signifies any negative waveform. So a positive signal applied to the inverting input produces a corresponding negative. Signal at the output, and a positive signal applied to the non-inverting input produces a corresponding positive signal at the output.

Suppose now that the inputs are energised simultaneously and, to keep things simple, the signals are of equal amplitued. The two possible configurations are shown in Figure 4.

The question is, of course, what is the direction of the output in each case?

Consider the case of in-phase inputs shown in Figure 4(a). The output changes due to each input will be equal and opposite



(a)

(b)

Figure 3(a). Action of inverting input. **(b). Action of non-inverting input.**

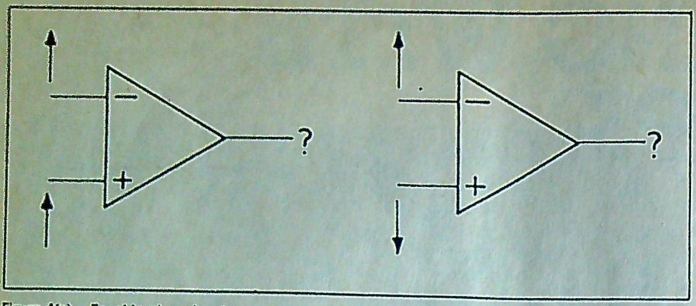


Figure 4(a). Equal in-phase inputs. (b). Equal anti-phase inputs.

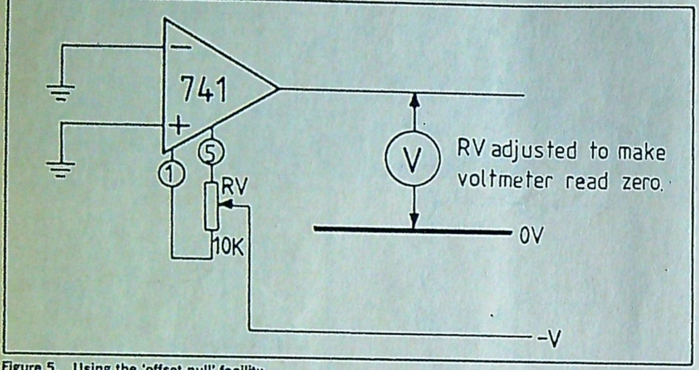


Figure 5. Using the 'offset-null' facility.

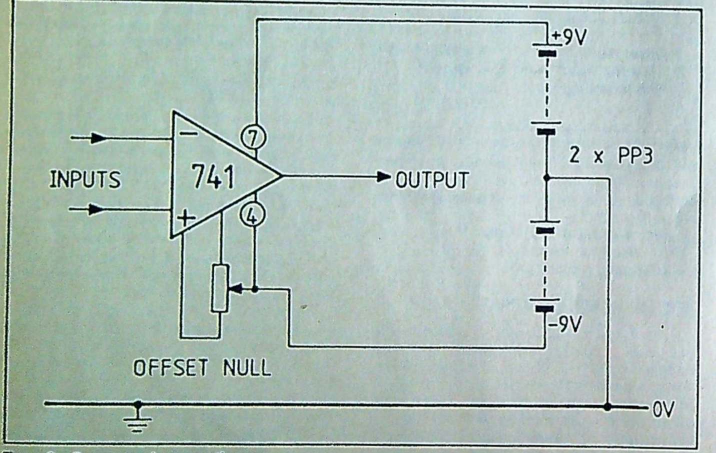


Figure 6. Power supply connections.

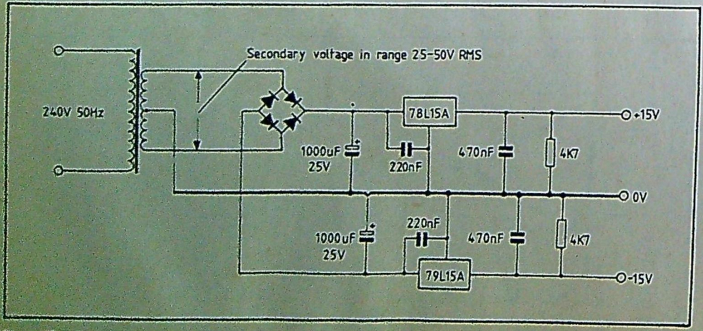


Figure 7. Mains-operated dual 15V op-amp power supply.

and the output will therefore remain unchanged.

In the case of anti-phase inputs, the positive signal at the - input will produce a negative output and the negative signal at the + input will also produce a negative output. So the two effects are additive, and a large output change occurs.

These two ways of driving the inputs are known as the differential-mode (anti-phase inputs) and common-mode (in-phase inputs) respectively. From this we can see that a principal characteristic of an op-amp is to amplify the former but reject the latter. This has great practical significance as we shall see in due course.

Offset Null

Having now discussed briefly the signal connections, we can consider the function of the two pins marked offset null.

Suppose we were to connect both inputs to 0V; we should expect the output to be also 0V, since there is nothing to amplify in order to produce an output. We might well be surprised, therefore, to find that the output was not in fact 0V at all but slightly offset from it, either above or below the 0V level. This arises because of the impossibility of manufacturing a perfectly symmetrical amplifier. However, the manufacturers allow for this by providing the 'offset null' facility. This is utilised in practice by connecting a potentiometer between the two offset null pins, with the wiper taken to -V. This would be a skeleton preset and is adjusted to bring the output to zero with both inputs also at zero. Figure 5 illustrates the technique.

Common-Mode Rejection Ratio

As stated previously there is a high gain in the differential mode of operation and zero gain in the common mode. However, the latter statement is not quite true; because of the imperfections already mentioned, the gain in common mode is small but it is not zero. This means that common-mode inputs will produce an output but it will be very small. In many practical situations, the

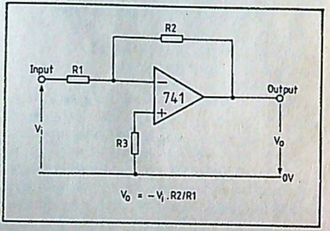


Figure 8. The inverting amplifier.

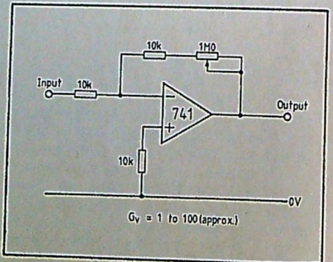


Figure 9. Inverting amplifier with variable gain.

signal is applied differentially but unwanted noise signals are picked up at both + and - inputs and present a common-mode input to the amplifier. Thus the signal is subject to very high gain and produces a large output, while the unwanted noise voltages have very low gain and produce very little output. How well the amplifier is able to separate signal and noise in this way is expressed by a factor known as the 'Common-Mode Rejection Ratio' (CMRR).

The CMRR can be calculated as follows:

$$\text{CMRR} = 20\log\left[\frac{\text{Differential mode gain}}{\text{Common mode gain}}\right]\ \text{dB}$$

So in practice the gain figures were 200 000 and 4 respectively, the CMRR would equal 20 log (200 000/4), which gives 94 dB; this would be a very good figure.

Power Supplies

The power supply pins are marked +V and -V since, in general, it is expected that the op-amp will develop outputs that swing either side of 0V. A typical pair of supplies would be ±15V, giving a possible output swing of 30V peak to peak. However, a convenient arrangement when experimenting consists of two PP3 batteries giving ±9V, as shown in Figure 6. PP3's will give adequate current for our purposes; one op-amp takes very little current.

For those who prefer a mains power supply, I have given a low-cost design in Figure 7. It uses a couple of small regulator chips to give ±15V at up to 100mA.

To explore the possibilities of the op-amp fully, access to some test equipment will be required. For example, an oscilloscope for examining waveforms, an audio sine/square-wave generator for providing inputs, and a multimeter for measuring current and voltage levels. Also some form of breadboard will be required such as the 'solderless plug-in types', or just a piece of Veroboard with an 8-pin IC socket and a few terminal pins.

Amplifier Configurations

Inverting

Figure 8 shows an inverting amplifier. The term inverting amplifier implies a 180° phase-shift between input and output. To define the input/output relationship fully the voltage gain must be known as well.

This is given by 'voltage gain = R2/R1', which shows that for a certain value of R1, the gain is determined by the choice of R2. Apart from using fixed resistor values, a potentiometer would give continuous control of gain or R2 could be switched to give gain changes in steps.

The unused + input is tied to 0V by R3. The value of this resistor is not usually particularly critical but it can be obtained from the formula R3 = R1R2/(R1 + R2), which gives the value for best 'drift-free' performance. Unless this is a particular criterion, a good rule of thumb is to let R1 = R3 = 10k and select R2 for the required gain.

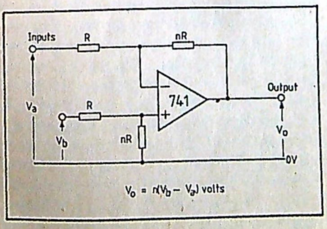


Figure 13. The subtractor amplifier.

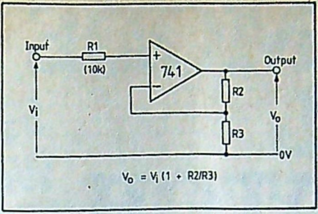


Figure 10. The non-inverting amplifier.

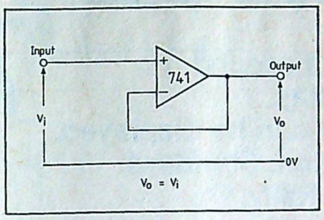


Figure 11. The voltage follower.

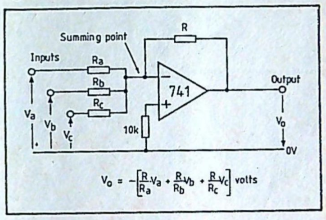

Summing point
R
Inputs
Ra
Rb
Rc
741
Output
V_a
V_b
V_c
10k
V_o
0V
$V_o = -\left[\frac{R}{R_a}V_a + \frac{R}{R_b}V_b + \frac{R}{R_c}V_c\right]$ volts

Figure 12. The summing amplifier.

Figure 9 shows an inverting amplifier in which the gain is continuously variable from 1 to 100 (approx.).

Non-inverting

An amplifier may be needed whose gain can be just as easily defined but which has zero phase-shift. An amplifier of this type is shown in Figure 10.

The gain of the non-inverting amplifier is also defined by the ratio of two resistors, R2 and R3. However, the expression for gain is slightly different from the previous case; it is now given by 1 + R2/R3. A very wide range of gain is feasible. The minimum value is clearly 1, which occurs when R2 = 0. If, at the same time, R3 is made equal to infinity (i.e. removed entirely), the circuit becomes that of the voltage follower.

Voltage Follower

Figure 11 shows a voltage follower which is so-called because it has a voltage gain of one and zero phase-shift. A circuit in which the input and output are identical may not, at first, seem very useful. Its value derives from the fact that it has a very high input impedance and a very low output impedance. This means that it can be used as a matching device between points of high and low impedance.

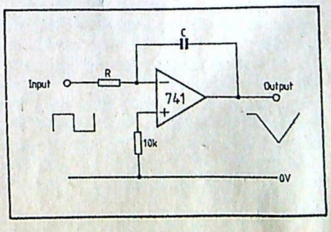


Figure 14. The integrator.

Summing and Subtracting

Sometimes it is necessary to add two or more voltages together, or obtain the difference of two voltages. The summing amplifier (Figure 12) and the subtractor amplifier (Figure 13) meet these requirements.

In the case of the summing amplifier, the gain for each input separately is determined by the ratio R/Ra, R/Rb, etc. If these ratios are all equal to one, then the output voltage is equal, literally, to the sum of the input voltages. But it is obvious that the input voltages can be scaled up (or down) by some factor R/Rx, either equally for all inputs or preferentially.

The same facility for scaling the gains for each of the inputs is also available for the subtractor, as Figure 13 should illustrate.

Integrator

The last basic configuration to examine is the integrator, which is shown in Figure 14.

This circuit performs the mathematical operation of integration. However, there is no need to become involved in integral calculus. In practical terms, the circuit responds to a step input voltage by producing a ramp of opposite sign. The slope of the ramp depends upon the amplitude of the step and the 'integrator gain' 1/RC volts/sec per volt of input.

Figure 14 also shows a full cycle of the square-wave input; the integrator output consists of alternate negative and positive ramps, corresponding to the leading and trailing edges, respectively, of the input. If the input was a continuous square-wave, the output would be a triangular waveform.

Given the right data, it is a simple matter to calculate the amplitude of the output, as follows: if R = 100k and C = 100nF, the integrator gain is $10^7/10^5$ = 100V/s per volt of input. This is more conveniently expressed as 0.1V/ms per volt. If the input was a 100Hz square-wave of 2V amplitude, then the slope of the ramp would equal 0.1V/ms x 2 = 0.2V/ms. Since the time of a half-cycle at 100Hz is 5ms, the amplitude of the output is 0.2V/ms x 5ms, which equals 1 volt.

The integrator principle has many applications. One of them appears in Figure 15, the circuit shown performing a time to voltage conversion.

The amplitude of the ramp output is proportional to the duration of a negative input pulse. In the absence of such a pulse, both diodes conduct and hold the output at 0V. The arrival of a pulse reverse-biases both diodes and the ramp starts running. The rate at which it runs is set by RV1, which acts as a form of 'sensitivity control'. Since the ramp runs until the pulse finishes (if RV1 has been set correctly), the final amplitude of the output is proportional to the length of the input pulse. ■

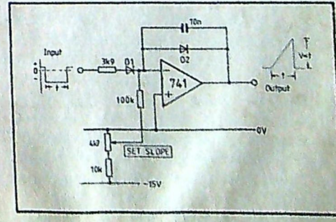
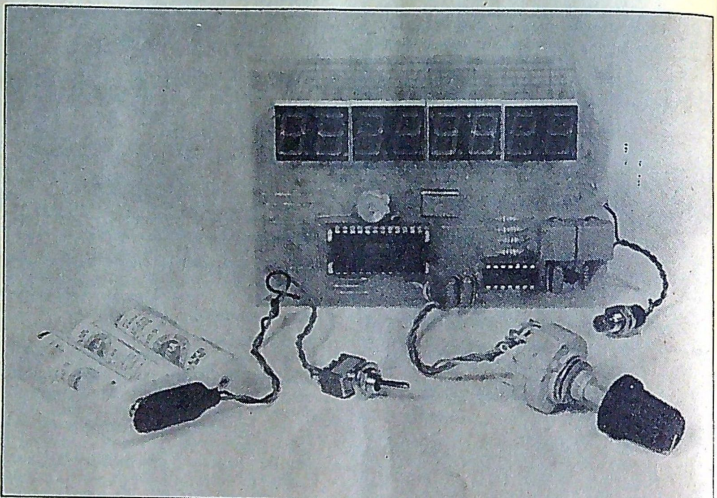


Figure 15. Circuit for time to voltage conversion.

MULTI~MODE DIGITAL STOPWATCH

- ★ Accurate to 100th of a second.
- ★ Large, eight digit display.
- ★ Times up to 24 hours can be displayed.
- ★ Four modes of operation: Standard, Sequential, Split and Rally.

by L. Harrold



This electronic stopwatch is a comprehensive timer which is more robust than a mechanical stopwatch and can measure accurately to 100th of a second. It has a remote start/stop facility which enables it to be triggered by the interruption of a light beam or the sound of a starting pistol etc.

The stopwatch has a large LED display which can be turned off while the clock is running to save battery power. It has four modes of operation: Standard - each timed event starts from zero, Sequential - the time between each operation of the start/stop switch is displayed (lap times etc.), Split - the timer counts continuously although timings can be displayed whilst this occurs, Rally - the same as Standard except that the clock is not reset to zero but continues from when it was stopped.

Circuit

The circuit diagram of the stopwatch is shown in Figure 1. The main component is the Intersil ICM 7045 IC which contains an oscillator, high frequency divider, low frequency counter, latches, multiplexer, decoder and control circuitry. The oscillator frequency is set by the external crystal and trimmer capacitor to 6.5536 MHz. This is divided down to 100 Hz to drive the low frequency counter. The counter outputs are connected to the latches so that the display can be held and read while the counter is still running. The outputs from the latches are multiplexed to drive an eight digit common cathode display. The ICM 7045 also contains the seven segment decoder and the digit and segment drivers so that the display can be connected directly.

The 4093 and associated components provide de-bounce circuits for the push switches. When a push switch is operated it discharges the capacitor in less than one millisecond. The two Schmitt trigger gates change state which takes the appropriate pin of IC1 low. The Schmitt triggers are inhibited until the capacitor has re-charged. The time constant of (R1+R2) and C1 is large compared to the bounce time of the switches.

The remote control input switches 5V which turns on the transistor and therefore has the same effect as the start/stop switch. The eight digit display can count up to 23 hours 59 minutes 59.99 seconds. After this the display carries on counting from zero.

The reset button sets the counter to zero, i.e. displays two zeros in the decimal part of the seconds. The seconds, minutes and hours part of the display are blank and remain so until that part of the display is not zero. The display switch turns the LED display on and off.

With the display on the current consumption is 70 to 130mA, depending on how many digits are on. When the display is off the consumption drops to a maximum of 2mA. Therefore if nickel cadmium batteries are used, which have a capacity of 500mA hours, this should give a life of several hundred hours.

The start/stop switch controls the counter and the four position switch selects the mode of operation.

Construction

The components are mounted on a single sided PCB and should be fitted as follows. The LED displays first: Note that on the side of the displays, that the 'M' of the code number is nearest to pin 1. IC holders should be used, especially for IC1, and these are fitted next. When the click switches are viewed from underneath, one side has a flat, and the PCB legend shows correct mounting orientation. The crystal and trimmer capacitor C5 are mounted next. The crystal should be folded over flat next to the PCB. Next the resistors can be fitted and the switches wired.

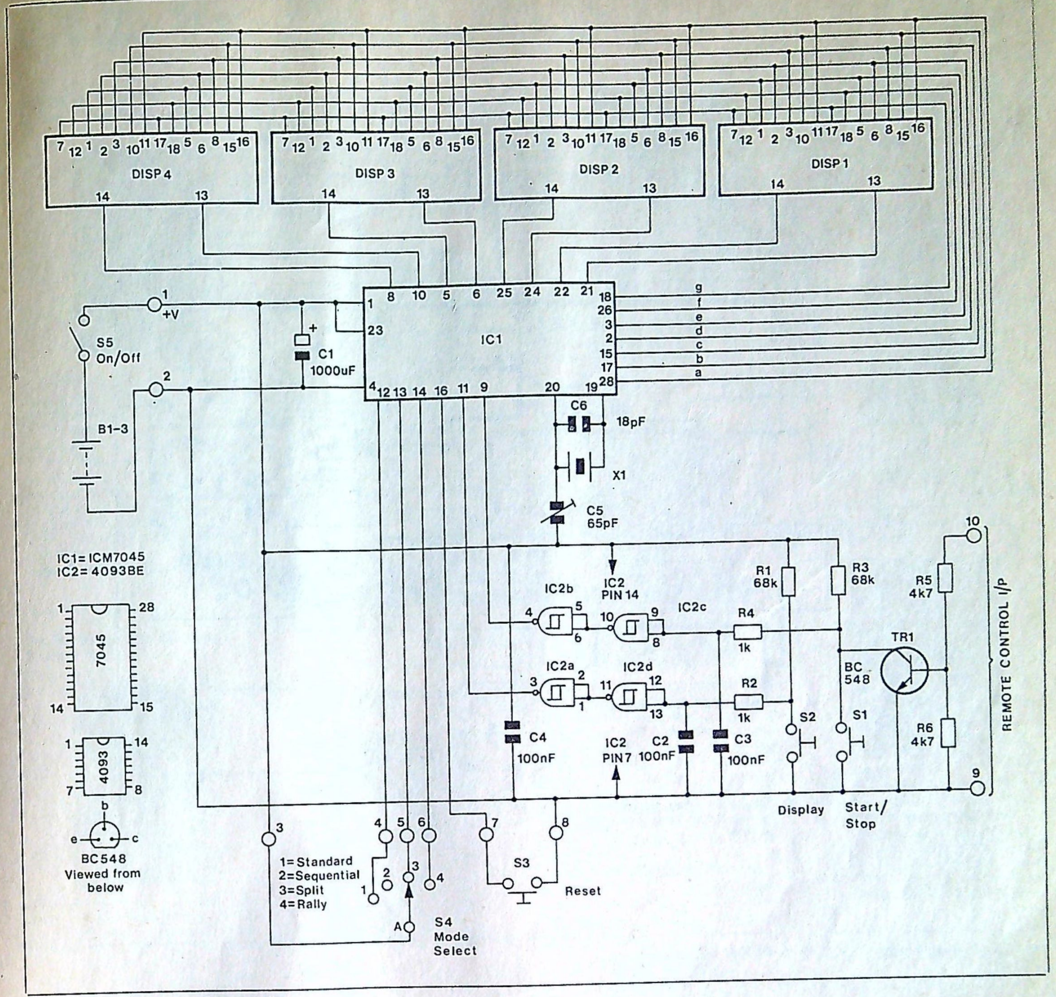


Figure 1. Circuit diagram of stopwatch.

Capacitors C2 to C4 and TR1 should be mounted and bent over at 45 degrees to give enough clearance for a front panel. Finally the wire links are wired and soldered, and C1 fitted underneath the PCB. The LED display is improved considerably when viewed through a red filter and it is recommended that one is used.

Setting up

For accurate timing the crystal should run at 6.5536 MHz and is adjusted by C5. If a frequency counter is available, this is easily checked without loading the oscillator as follows. A 10k pull up resistor should temporarily be connected between pin 22 of IC1 and the positive supply. The display should be switched on and the counter reset. The frequency on pin 22 should be 800Hz. To get the required accuracy, the frequency counter should be switched to period and the period for one cycle measured as 1250.00 microseconds. Adjust the trimmer capacitor to give the right frequency. If a frequency counter is not available, then C5 should be set half way and the stopwatch checked over several hours, using the radio or speaking clock. C5 can then be adjusted accordingly; more capacitance to slow the stopwatch down.

Operation

Standard Mode

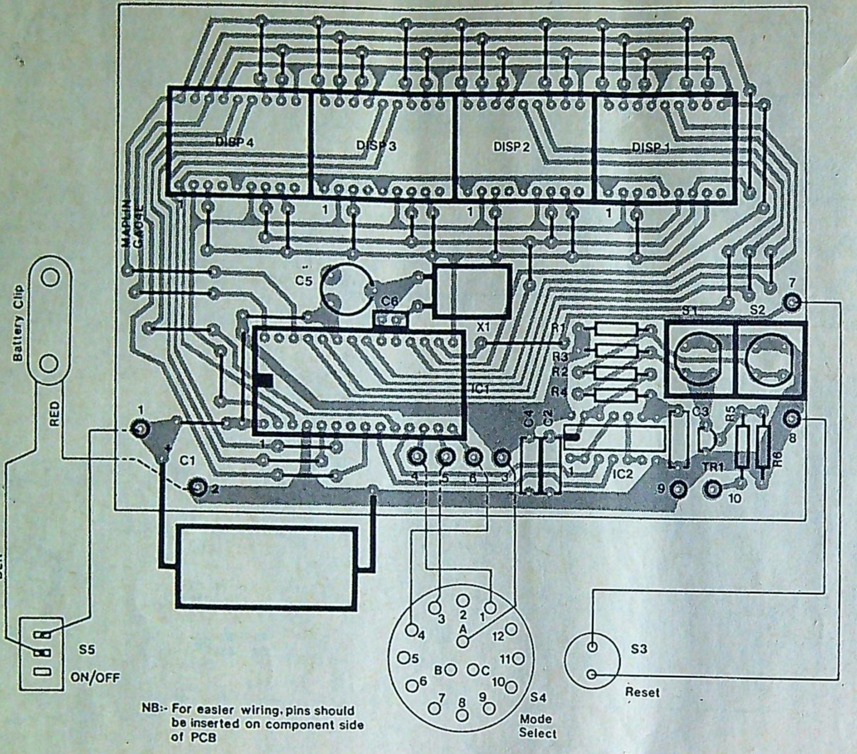
1. Press the reset switch to zero the counter.
2. Start the counter by pressing the start/stop switch.
3. Stop the counter by again pressing the start/stop switch. The time is now displayed. When start/stop is pressed again the counter is momentarily reset then starts timing another event. In this mode the display can be turned off.

Sequential Mode

1. Reset the counter.
2. Start the counter.
3. Press start/stop to read the display. This time is held on the display but the counter continues running. When start/stop is next pressed the time since it was last pressed is displayed. This enables lap times to be taken. The display cannot be turned off in this mode, however, if standard mode is selected it can be, but remember to switch back to sequential mode before pressing the start/stop switch.

Split Mode

1. Reset the counter.
2. Start the counter.
3. Press start/stop to read the display. This time is held on the display but the counter continues running. Each time the start/stop is pressed the display shows the total time since



NB:- For easier wiring, pins should be inserted on component side of PCB

Figure 2. Component overlay and wiring diagram of stopwatch.

the start/stop was first pressed. The count can only be stopped by pressing reset.

The display can only be blanked if the same procedure as described for the sequential mode is carried out.

Rally Mode

1. Reset the counter.
2. Start the counter. The reset switch is now automatically disabled thus preventing accidental resets during long timing intervals.
3. Stop the counter.
4. Press start/stop again allowing the counter to continue.

The display can be turned off in this mode. ■

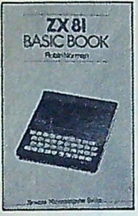
STOPWATCH PARTS LIST

Resistors — all ¼W 5% carbon unless specified			
R1,3	68k	2 off	(M68K)
R2,4	1k0	2 off	(M1K0)
R5,6	4k7	2 off	(M4K7)
Capacitors			
C1	1000uF 10V axial electrolytic		(FB81C)
C2,3,4	100nF polyester	3 off	(BX76H)
C5	Trimmer 65pF		(WL72P)
C6	18pF ceramic		(WX47B)
Semiconductors			
TR1	BC548		(QB73Q)
IC1	ICM7045		(YY93B)
IC2	4093BE		(QW53H)
X1	Crystal 6.5536 MHz		(FY90X)
Miscellaneous			
DISP1-4	DD display type C	4 off	(BY68Y)
S1,2	Click switch	2 off	(FF87U)
S3	Push switch		(FH59P)
S4	3 pole 4 way rotary switch		(FF75S)
S5	Sub-min toggle 'A'		(FH00A)
B1-3	Ni Cad AA	3 off	(YG00A)
	4V5 battery box		(YR61R)
	PP3 clip		(HF28F)
	Veropin 2141	10 off	(FL21X)
	Click cap blue	2 off	(FF89W)
	Stopwatch PCB		(GA04E)
	Knob		(YG40T)
	Knob cap blue		(QY01B)
	DIL skt 28-pin		(BL21X)
	DIL skt 14-pin		(BL18U)
	Filter red		(FR34M)

A complete kit for this project is available. Order As LW65V (Stopwatch Kit) Price £34.95

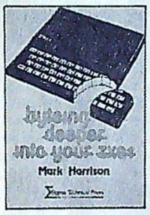
NEW BOOKS

ZX81 Basic Book
by Robin Norman



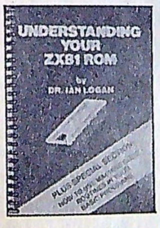
If you have a ZX81 or are thinking of buying one, this book will tell you all you need to know to get the best from it. The book covers the basic version, the expansion RAM and the ZX printer. There are 14 original programs for the ZX81 and a glossary of technical terms. The undemanding writing style makes this a perfect beginner's introduction.
1982. 176 pages. 210 x 132mm. Illustrated.
Order As WG74R (Book NB178)
Price £5.95*NV*

Byteing Deeper Into Your ZX81
by Mark Harrison



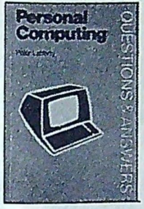
If you are thinking of buying a ZX81 this book will tell you what a ZX81 will do and what it is like to use one. If you already own a ZX81 the book shows how to program it efficiently and includes 37 programs that will work on the standard (unexpanded) version. Packed with useful information.
1981. 160 pages. 210 x 148mm. Illustrated.
Order As WG83E (Book JW413)
Price £5.95*NV*

Understanding Your ZX81 ROM
by Dr. Ian Logan



The book explains Z80 machine code language and discusses the workings of the 8K monitor program. The attraction of machine code programming is that it offers the programmer the possibility of producing programs that run at great speed and can be as complicated, for their size, as any programs written for larger machines.
1981. 164 pages. 214 x 148mm.
Order As WG75S (ZX81 ROM by Logan) **Price £9.95***NV*

Questions & Answers On Personal Computing
by Peter Lafferty



The book discusses the cpu, peripheral devices, programming and also looks at several of the popular personal computers available at the moment. The book answers questions that puzzle the beginner and student from first principles to a useful level of practical knowledge.
1981. 96 pages. 165 x 110mm. Illustrated.
Order As WG76H (Book NB555)
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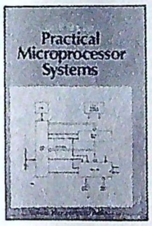
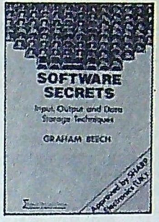
Practical Microprocessor Systems
by Ian R. Sinclair



The book provides a description of how a microprocessor is connected to its supporting chips and how programs are written and developed for such units. The author deals with hardware, software and firmware through a rudimentary 'build-it-yourself' assessment unit which will help the reader grasp the practicalities involved in microprocessor system design.
1981. 144 pages. 217 x 136mm. Illustrated.
Order As WG78K (Book NB496)
Price £5.95*NV*

Software Secrets
by Graham Beech
The book covers techniques of programming with particular emphasis on screen output, keyboard input and file handling. The book is intended primarily for Sharp MZ-80K users and about 30 programs and sub-routines are included. The techniques shown are seldom covered in programming books. An understanding of them will help you to produce computer games and other graphics software and show you how to store and process data on cassette or disk.
1981. 144 pages. 210 x 147mm. Illustrated.


SOFTWARE SECRETS
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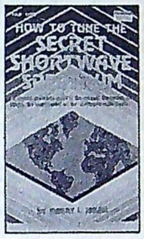
How To Tune The Secret Shortwave Spectrum
by H. L. Helms



Have you ever wondered what coded messages used by spies sound like? Or about an echo that comes back from 'nowhere', with a time-lag unexplainable with our present knowledge of propagation and transmitter power? If your curiosity is stirred by the subject of unusual signals then this is the book for you. It's a shortwave listener's bible. American book.
1981. 182 pages. 210 x 130mm. Illustrated.
Order As WG80B (Book FT1185)
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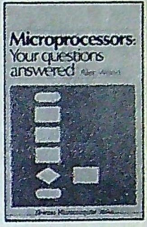
Teaching Your Computer To Talk
by E. R. Teja

TEACHING YOUR COMPUTER TO TALK
a manual of commands and responses

The book describes and explains the principles of speech synthesis and recognition and looks at some of the ready-made systems available. Interfacing to microprocessors is described and some sample programs are shown. American book.
1981. 208 pages. 210 x 130mm. Illustrated.
Order As WG81C (Book FT1330)
Price £6.95*NV*

Microprocessors: Your Questions Answered
by Alec Wood
A plain language answer to most of the questions that baffle the newcomer to the subject, whether student or hobbyist. The book explains the microprocessor and binary arithmetic and how the microprocessor uses it to carry out arithmetical operations. The book then describes the rest of the hardware and software needed to build up a complete microprocessor system.



1982. 160 pages. 216 x 137mm. Illustrated.
Order As WG79L (Book NB580)
Price £5.95*NV*

Questions & Answers On Video
by Steve Money

What are VHS, Betamax, V2000 and LVR? How is a television picture displayed? What are SECAM and PAL? How does a video camera work? What are the basic types of video recorder? How is a picture contained in a video disc? These and many more questions are answered clearly and concisely.
1981. 116 pages. 165 x 110mm. Illustrated.
Order As WG77J (Book NB553)
Price £2.85*NV*

Designing, Building & Testing Your Own Speaker System
by D. B. Weems

The book contains many detailed plans for speaker-box construction from one, two or three-way systems. Simplified design charts are provided so that it is easy to design your own system. Full circuit details of many different types of crossover networks are given and much of the theory is also explained. American book.
1981. 192 pages. 210 x 130mm. Illustrated.
Order As WG82D (Book FT1364)
Price £6.45*NV*

STARTING POINT

by Robert Penfold

Introducing the fundamentals of electronics for the constructor.

Amplifying Modes

We have looked at the basic characteristics and configurations of the three amplifying modes possible using a transistor, and we will now consider each mode of operation in greater detail.

Common Emitter

The output impedance of a common emitter amplifier is easily determined and is simply equal to the value of the collector load resistor. The required base bias resistor value can be calculated by taking the collector load value and multiplying it by the typical current gain of the transistor in use (which can be found by referring to the data sheet for the device concerned). This assumes that there is an equal voltage across the collector and base bias resistors, but this is not quite the case with the quiescent output voltage at half the supply voltage, due to the 0.6 volts or so developed across the base-emitter junction of the transistor. This voltage reduces the voltage across the base bias resistor by about 0.6 volts, with a consequent reduction in the base bias current and the collector voltage being a little higher than the ideal voltage.

In practice this can be overcome by using a value slightly lower than the calculated one. For example, if the calculated figure was 1.7 megohms, in practice a 1.5 megohm component should give good results. If a low supply voltage is employed, such as a 3 volt supply for example, the base-emitter voltage becomes a substantial fraction of required collector voltage of 1.5 volts, and this simple method of calculation becomes decidedly inaccurate.

A more accurate method is to take the required quiescent collector current and then divide this by the typical current gain of the transistor to obtain the necessary base current. Taking 0.6 volts from half the supply voltage gives the potential across the bias resistor, and dividing this by the base current gives the bias resistor value in ohms. This is, of course, just a simple application of Kirchhoff's Voltage Law and Ohm's Law.

A problem when calculating bias resistor values is that the calculations are based on the typical current gain figure for a transistor, whereas in a practical circuit the transistor used could actually have a gain which is considerably higher or lower than the typical figure. The tolerance of the base bias and collector load resistors could also result in errors in the bias levels.

These errors are corrected to a certain extent by negative feedback. If the gain of the transistor is higher than the typical figure and (or) the bias resistor has a lower value than its nominal one, the collector voltage will be lower than expected. This reduces the voltage across the base bias resistor and produces a lower base current which tends to increase the collector voltage. Similarly, if the transistor has a current gain which is lower than the typical figure and (or) the bias resistor is slightly high in value, this gives a higher collector voltage than expected. This gives increased voltage across the bias resistor, increased base current, and reduced collector voltage.

This negative feedback will not fully compensate for errors in gain or bias resistor values, but it is normally sufficient to keep the effect of these errors down to a level which renders them of no practical significance. It is in order to obtain the negative feedback that the bias resistor is connected between the collector and base of the transistor, rather than the more obvious method of connecting it between the base and the appropriate supply rail, which would not give any regulating feedback.

The input impedance of a common emitter stage is controlled mainly by the collector current and current gain of the transistor. High gain gives high input impedance, but high collector current gives low input impedance. Approximate input impedance is given by the equation:

$$\frac{25}{\text{collector current in mA}} \; h_{FE}$$

The voltage gain of a common emitter stage is roughly equal to:

$$\frac{\text{Load Resistance}}{25 \div \text{collector current in mA}}$$

However, voltage gain varies somewhat with changes in supply voltage (higher supply voltages giving higher gains) and this does only give an approximate figure for voltage gain.

Emitter Resistor

The input impedance of a common emitter amplifier can be increased by the inclusion of an emitter resistor, as shown in Figure 1, but the negative feedback that this introduces also reduces the voltage gain of the circuit. There is no obvious feedback path introduced by the emitter resistor, but it does in fact introduce negative feedback. If the input signal takes the base of TR1 more positive, this gives an increase in the collector and emitter currents, and the voltage across R3 increases. This counteracts the increase in base voltage of TR1 to a certain extent and reduces the voltage gain of the circuit. Similarly, a reduction in the base voltage of TR1 gives reduced voltage across R3 and a partial cancelling of the change in input potential. Again, this gives a reduction in the voltage gain of the circuit.

The collector and emitter currents of a transistor are practically the same, and the only difference between the two is that the emitter current is actually equal to the sum of the collector current and the small base current, and is therefore marginally higher than the collector current. When discussing the emitter follower mode the voltage gain of approximately unity from the base to the emitter of the transistor was explained, and the same occurs in this configuration. If R2 and R3 have the same value, any change in voltage across R3 will be matched by a practically identical voltage change across R2, and the circuit has roughly unity voltage gain from the base to the collector as well as from the base to the emitter. If R2 is made higher in value than R3, the voltage change across R2 will be proportionally higher than that across R3. On the face of it this gives the

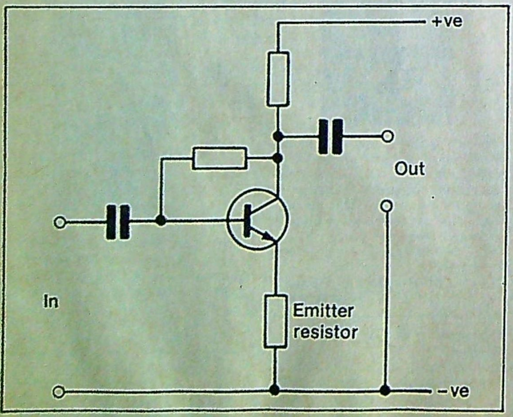


Figure 1. **Adding an emitter resistor introduces negative feedback.**

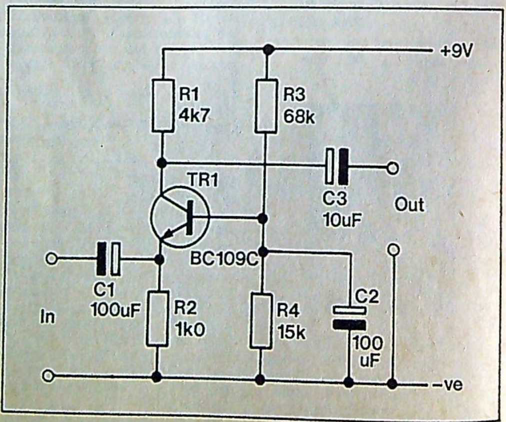


Figure 2. **The circuit of a practical common base stage.**

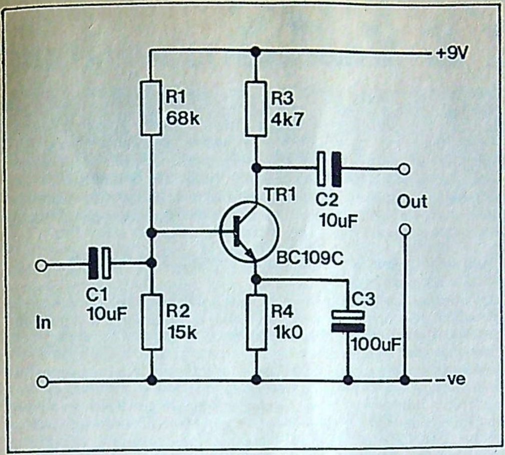


Figure 3. A common emitter stage using potential divider biasing.

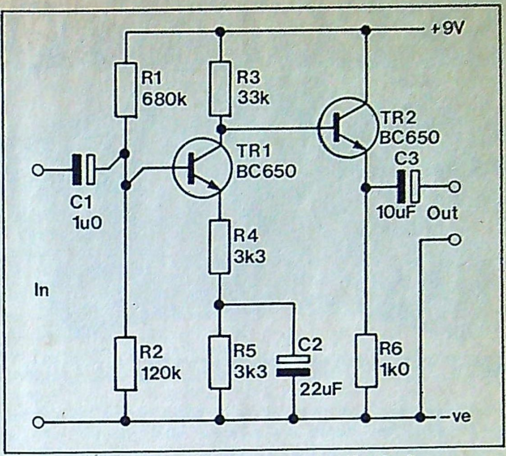


Figure 4. A simple two stage direct coupled preamplifier circuit.

circuit a voltage gain of R2 ÷ R3, but this is not the case if R3 is made very low in value when compared to R2.

The reason for this is the innate emitter resistance of TR1 which must be added to any external emitter resistance. This resistance varies with collector current, and is approximately equal to 25 divided by the collector current in milliamps. In the voltage gain equation given earlier the innate emitter resistance was calculated using this method and then divided into the collector load resistance in order to give the voltage gain figure. With an external emitter resistance present, the sum of this resistance and the innate emitter resistance must be divided into the collector load resistance in order to obtain the voltage gain of the circuit.

Input Impedance

In the input impedance equation given earlier the innate emitter resistance of the transistor is first calculated, and is then multiplied by the current gain of the transistor in order to give the input impedance. If an external emitter resistor is present, the sum of this resistance and the innate emitter resistance of the transistor must be multiplied by the current gain of the transistor in order to give the input impedance. This gives the input impedance to the base of the transistor and does not take into account the effect of any components at the input such as biasing and coupling components.

Emitter Follower Mode

The input impedance of an emitter follower stage is calculated in the same way as the input impedance of a common emitter amplifier having an emitter resistor. As the internal emitter resistance of the transistor is often far lower than the emitter load resistor's value, simply multiplying the load resistance by the current gain of the transistor usually gives a reasonably accurate figure for input impedance. An important point to note, however, is that the input impedance of any circuit following the amplifier is effectively in parallel with the emitter resistor, and the combined impedance of the emitter resistor and the input impedance of the driven circuit must be used when calculating the input impedance of the stage.

The emitter follower mode gives an output impedance which is approximately equal to the source impedance of the input signal divided by the current gain of the transistor. In practice this often gives a very low output impedance, and the output signal reduces little in amplitude even if it is feeding a quite low impedance load. However, it is important to bear in mind that an AC emitter follower can only give a peak output current equal to the quiescent current of the transistor. Thus, if it is feeding into a load impedance which is much lower than the emitter load resistor value, but much higher than the output impedance of the stage, the maximum peak-to-peak output voltage available will be far less than the supply voltage.

The two bias resistors for an emitter follower stage ideally have values which bias the base to about 0.6 volts more than half the supply voltage, but the shunting effect of the input resistance of the stage must not be overlooked, and this is effectively connected in parallel with the lower bias resistor and reduces its value. For good predictability of the bias voltage it is preferable to have bias resistors which are low in value when compared to the input resistance of the amplifier, since resistor tolerances are usually much smaller than those of transistor gain figures (where tolerances of around ± 100% are not unknown!).

Unfortunately, the input signal drives a current through the bias resistors as well as into the base of the transistor, and the input impedance of the amplifier is equal to the parallel impedance of the two bias resistors and the input impedance of the transistor. In many cases a high input impedance is needed, and the severe shunting effect of low value bias resistors is undesirable. This may necessitate a compromise and the use of bias resistors of comparatively high values, or as we shall see in a subsequent 'Starting Point' there are alternative forms of buffer amplifier that can be used. Of course, in any circuit where highly accurate biasing is needed a preset resistor can be used in the bias circuit so that the output bias voltage can be set at precisely the required level.

Common Base Stage

We will not consider this type of amplifier in great detail since it is rarely encountered in practice. Figure 2 shows the method of biasing often employed with common base stages, and gives practical circuit values which help to show the mathematics of this type of biasing. This type of biasing can also be used for common emitter amplifiers, as shown in Figure 3.

Taking Figure 2 first, R3 and R4 bias the base of TR1 to a little over 1.5 volts, and the shunting effect of the input resistance of TR1 does not significantly reduce this as the input resistance is high in relation to the value of R3. There is a voltage drop of about 0.6 volts or so from the base of TR1 to its emitter, and this gives a little under 1 volt across R2. The potential across R1 will be about 4.7 times this voltage as it is 4.7 times higher in value and passes a similar current to R2. This gives approximately the required potential of 4.5 volts across R1.

C1 is the input coupling capacitor and needs to have a quite high value as it is feeding into a low input impedance. C2 also needs to have a fairly high value as it must provide a low impedance path to earth for the base of TR1. C3 is the output coupling capacitor, and although the value shown here is a typical one, the value would be chosen to suit the input impedance of the subsequent stage in practice.

The voltage gain of a circuit of this type is comparable to that of a common emitter stage having the same collector load value, bias current, and using the same transistor type. The output impedance is equal to the collector load resistor's value.

The biasing of the common emitter amplifier of Figure 3 operates in exactly the same way as the biasing of the common base stage of Figure 2. The point of this type of biasing is that the current gain of the transistor has very little effect on the bias voltages, and this enables predictable results to be obtained. In Figure 3 emitter resistor R4 has been bypassed by C3, the latter providing a low impedance path from TR1's emitter to earth so that no significant negative feedback is applied over the amplifier. Negative feedback can be applied to this type of circuit by omitting the bypass capacitor, or by having two emitter resistors in series and only bypassing one of them if the full amount of negative feedback is not required.

Sometimes it is possible for one stage of an amplifier to be biased from the output of this is shown in Figure 4. Here an emitter follower output stage is driven direct from the output of a common emitter stage. The quiescent potential of about 4.5 volts at the collector of TR1 is obviously a suitable bias voltage for TR2. This simple preamplifier has an input impedance of about 100k, a voltage gain of approximately ten, and the output impedance is only about 40 ohms. ■

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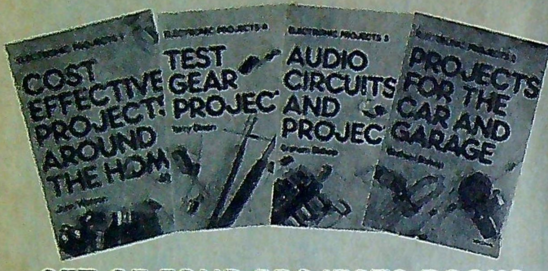

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Electronic Projects No. 3: Audio Circuits And Projects

by Graham Bishop

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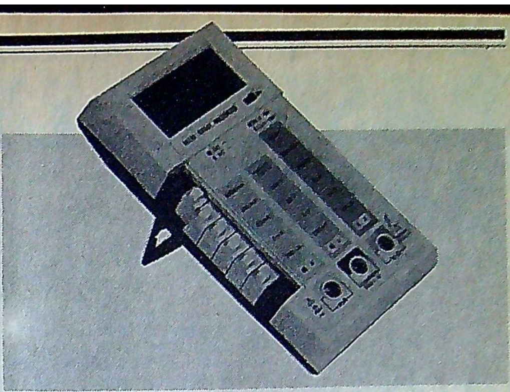


An introductory offer on our new digital multimeter. To be included in our range of multimeters, this one will sell for £39.95, but we are offering it for three months for £5 off - just £34.95. You've probably seen digital multimeters with the same styling and specification for nearly twice this price from some suppliers. Well, we've slashed that price and given you an extra £5 discount into the bargain.

The meter is attractively styled in a two-tone brown plastic case with a tilt stand and front panel printed in five colours for easy function identification. The easy-to-use push-button range selectors permit one hand operation. Now just look at this incredible specification.

Specification:

General
Display: 3½ digit LCD with auto-zero and auto-polarity.
Operating temperature: 0°C to 50°C
Storage temperature: -35°C to 65°C, battery removed
Low battery indicator: "LO BAT" appears on display during last 20% of battery life
Weight including battery: 400g
Size: 170 x 89 x 38mm.
Calibration adjustment: 3 readings per second.
Accuracies are ± (% of reading + no. of digits).

DC Voltage
Ranges: 200mV, 2V, 20V, 200V, 1000V
Resolution: 100uV on 200mV range
Accuracy: 0.5% + 1 digit
Input impedance: 10MΩ
Normal mode rejection: >60dB at 50Hz
Common mode rejection: >100dB at DC and 50Hz
Response time: <1 second
Overload protection: 63mA fuse

DC Current
Ranges: 200uA, 2mA, 20mA, 200mA, 2A
Resolution: 100nA on 200uA range
Accuracy: 1% + 1 digit on 200uA, 2mA and 20mA ranges, 2% + 2 digits on 200mA and 2A ranges
Burden voltage: 200mV max at full scale except 700mV on 2A range full scale
Response time: <1 second
Overload protection: A pair of fast switching, high current silicon diodes and a 2A fuse

AC Voltage
Ranges: 200mV, 2V, 20V, 200V, 750V
Resolution: 100uV on 200mV range
Accuracy: 45Hz to 400Hz 1% + 5 digits
Conversion type: Average sensing, calibrated to read RMS of sine wave
Input impedance: 10MΩ <100pF
Overload protection: 63mA fuse

AC Current
Ranges: 200uA, 2mA, 20mA, 200mA, 2A
Resolution: 100nA on 200uA range
Accuracy: 45Hz to 400Hz
3% + 5 digits on 200uA range
2% + 5 digits on 2mA range
3% + 2 digits on other ranges
Burden voltage: 250mV max at full scale, 700mV on 2A range full scale
Response time: <2 seconds
Overload protection: A pair of fast switching, high current silicon diodes and a 2A fuse

Resistance
Ranges: 200Ω, 2kΩ, 20kΩ, 200kΩ, 2MΩ, 20MΩ
Resolution: 0.1Ω on 200Ω range
Accuracy: 0.5% + 1 digit on 200Ω range, 0.5% + 2 digits on 2k to 2M ranges, 2% + 1 digit on 20M range
Open circuit voltage: Selectable - high <2.8V, low <0.54V
Overload protection: 63mA fuse

In addition to the various overload protection devices described above, the meter has transient protection on all voltage and resistance ranges up to 6kV. Also the input to the AC converter is protected against overvoltage. The meter requires a standard PP3 battery (not supplied), but there is a socket for connecting a 9V adaptor for mains operation and this input is protected against overvoltage and reverse polarity.

The meter is supplied with a pair of test probes and a circuit diagram.

In fact we think you'll agree that it's a bargain not to be missed. So order now!

Order As SP87U (Multimeter DD601) Price £34.95

— OFFER CLOSES MAY 29TH 1982 —

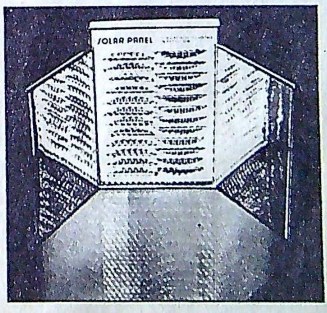
SOLAR CELLS

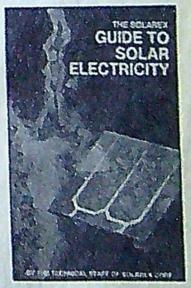
Never has there been more interest in solar power than now. The hazards of nuclear power and the pollution caused by burning hydrocarbon fuels as well as the fact that they may run out in the near future have made the search for clean, safe power sources all the more urgent. The solar cell was first made in quantity to supply power for satellites, but it was soon realised that they could be used as an endless power source on earth. Now you can investigate the possibilities with our new range of solar cell panels.

Each solar panel contains crescent shaped silicon solar cells connected so as to supply 6V, 9V or 12V at 50mA when the incident light is about 100mW/sq cm. The cells are mounted in an attractive and sturdy black plastic case. The plastic faceplate comprises hundreds of bubble magnifiers which maximise cell performance as they enhance the light striking the solar cells. Two reflector panels fit on either side of the case and increase cell efficiency even more.

Three solar panels are available 6V, 9V and 12V DC all at 50mA.

Order As RK22Y (Solar Panel 6V) Price £7.95
RK23A (Solar Panel 9V) Price £9.95
RK24B (Solar Panel 12V) Price £8.45




THE SOLAREX
GUIDE TO SOLAR ELECTRICITY
BY THE TECHNICAL STAFF OF SOLAREX CORP

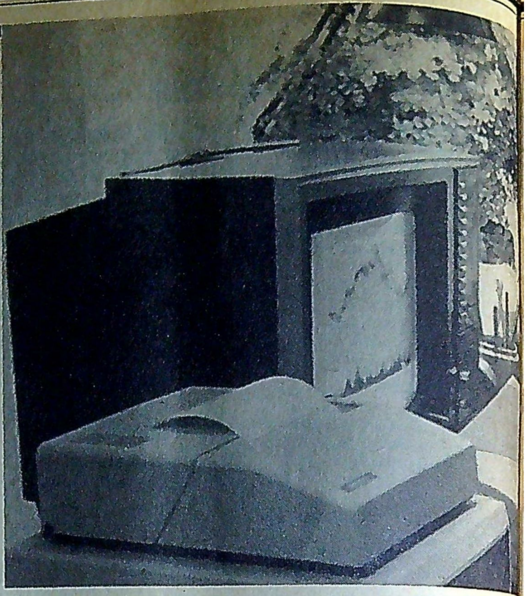
Guide To Solar Electricity

This excellent book by the manufacturers of the solar panels described above discusses the solar cell in detail, yet is easy to read and understand. The book briefly discusses sunlight, then describes the photovoltaic effect, practical solar electric generators, how to use solar cells and applications of solar cells. It is interesting to note from this fascinating book that the solar energy reaching less than one per cent of the Sahara desert is more than all the electrical energy used in the world today!

Order As WG85G (Guide To Solar Elect) Price £4.95NV

BASICALLY BASIC

Graham Hall, B.Sc.



BASIC Functions

One of the features of the BASIC language which makes it suitable for such a wide range of applications, is the set of pre-written instructions that can perform commonly used operations. These instructions are called 'Functions'. The functions to be described are the more common ones available on most personal computer systems. The list is not exhaustive, and the way in which they are used in the particular version of BASIC used by your machine may be slightly different from the description here. You should check the users reference manual, for your computer for the complete description of functions available in your machines version of BASIC.

There are three types of functions: math, print and string. Math functions perform mathematical operations, print functions cause operations on terminal output and string functions perform operations on quoted strings or string variables. String functions will be described later in this series.

Math Functions

There are two types of math function - arithmetic and trigonometric. Table 1 lists and summarises the common math functions which are fully described below.

ABS Function

To use the ABS (Absolute value) function the function keyword is followed by an argument enclosed in parenthesis, on a statement line. The result returned is the magnitude, regardless of sign, of the argument. For example the absolute value of both +15 and -15 is 15. The following program demonstrates this:

```
10 PRINT ABS(15), ABS(-15), ABS(0-10)
20 END
RUN
15  15  10
```

The argument of the function can be any valid BASIC expression, variable or constant. The ABS function is useful for scientific applications where the magnitude of a number is required and not its sign.

EXP Function

The EXP (Exponential) function computes the value of the mathematical constant 'e' raised to the power of the numeric argument specified to the function within parentheses. The constant 'e' is the base of natural logarithms (to six sigificant digits, e = 2.71828). For example, to raise e to the power of two the EXP function can be written in a program as: 10 PRINT EXP(2). The inverse of the EXP function is the LOG function, which computes the logarithm to the base e of an argument (this is known as the 'natural logarithm'). This relationship can be demonstrated by combining the EXP and LOG functions:

```
10 PRINT "EXP (2) = " ; EXP(2)
20 PRINT "LOG(2) = " ; LOG(2)
30 PRINT "LOG (EXP(2)) = " ; LOG (EXP(2))
40 PRINT "EXP (LOG(2)) = " ; EXP (LOG(2))
50 END
RUN
EXP(2) = 7.38906
LOG(2) = 0.69315
LOG(EXP(2)) = 2
EXP(LOG(2)) = 2
```

Lines 30 and 40 of the above function program are the inverse of each other. They illustrate how the argument to a function can be another function. The EXP function is useful for scientific applications.

INT Function

The argument to the INT (Integer) function can be any valid constant, variable, function or expression. The value returned is the largest integer less than or equal to the argument, i.e. the integer part of the argument is separated from the fractional part. For example:

INT (3.142) = 3, INT (0.69) = 0 and INT (-4.15) = -5

Note the value returned for a negative argument is a greater negative integer.

LOG Function

The LOG (Logarithm) function computes the natural logarithm (logarithm to the base e) of its argument. The argument can be any positive constant, variable, function or expression which evaluates to a positive number. An error message will be printed if the argument is equal to or less than zero.

Some versions of BASIC also have a logarithm function which determines logarithms to the base ten (common logarithm). However, if your version of BASIC does not include this facility it is possible to convert the arguments natural logarithm to another base by dividing the natural logarithm of the argument by the natural logarithm of the new base. For example to find the logarithm of five to the base ten (common logarithm):

```
10 PRINT "LOGARITHM TO BASE 10 of 5 = " ;LOG(5)/LOG(10).
20 END
RUN
LOGARITHM TO BASE 10 of 5 = 0.69897
```

RND Function

The RND (Random) function generates a random number between zero and one (but not including zero or one). The argument of the RND function can be any positive integer, zero or negative integer. The way the argument determines the operation of the RND function differs for different versions of BASIC. Usually, any positive integer within parentheses gives a new random number each time the RND function is used in a program. With zero or a negative integer specified, the same random numbers are generated. This is useful for debugging a program because if the numbers generated by the RND function is varied for each execution, program errors would be difficult to find. Some versions of BASIC do not require the RND function to be specified with an argument. In this case a RANDOMIZE statement is included in a program before the RND statement, if different random numbers are required for each program execution. The random numbers generated by the RND function can be modified by expressions involving other BASIC functions and operators. For example, to generate a random integer between one and one hundred:

```
10 PRINT INT(100 * RND(1)) + 1
```

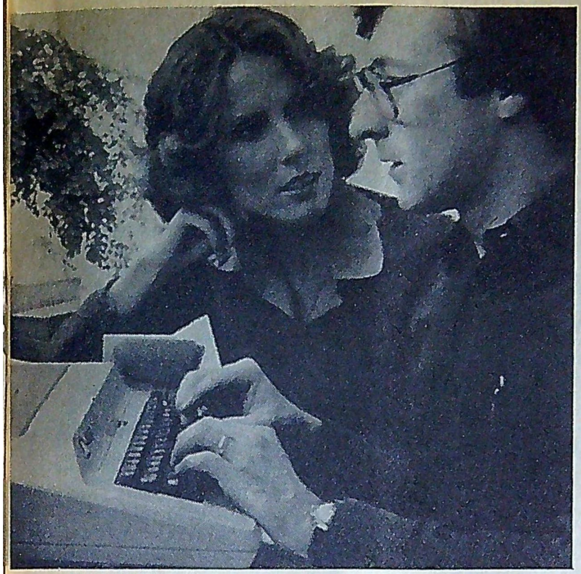
The argument of the INT function is '100 * RND(1)' which is an expression consisting of a constant, 100, multiplying a random number generated by the RND function. The result of this combination of functions is a random integer between zero and ninety-nine. The range is adjusted from one to a hundred by adding the constant one to each number generated.

The RND function is especially useful for games programs and simulations.

SGN Function

The SGN (Sign) function returns a result which depends on the sign of the argument. The argument can be any valid constant, variable or expression. If the argument evaluates to a positive value the SGN function returns a 1; a zero would be returned if the argument evaluates to zero; otherwise a -1 is returned when the argument evaluates to a negative value. An example of this is:

```
10 ON SGN (x) + 2 GOTO 200,300,400
```



Here the constant two is added to the result returned by the SGN function. The result is now a positive integer (1,2 or 3) which is used as an argument to the ON GOTO statement to make a branch.

If X is negative, the result of SGN (X) +2 is 1, which directs program control to line 200. If X is 0, the result of SGN (X) +2 is 2, which directs program control to line 300. A branch is made to line 400 when X is positive because then the result of SGN (X) +2 is 3.

SQR Function

The SQR (Square Root) function determines the square root of its argument. The argument can be a positive constant, variable or expression. An error message will be returned if the argument specified is negative. However, some versions of BASIC convert a negative argument to its absolute value and return the square root of the converted value. For example, PRINT SQR(4) will output a 2 to the terminal. The command PRINT SQR(-4) will cause an error message to be output unless the absolute value of the argument is taken by the SQR function.

Trigonometric Functions

ATN Function

The ATN (Arctangent) function is a trigonometric function that accepts a numeric argument. The ATN function computes and returns the principal value of the arctangent of the argument in radians (or angular measure). This will be within the range: $-\pi/2 < ATN(x) < \pi/2$.

The relationship between the radian and degree is:

1 degree = $\pi/180$ radians, where π represents the circular constant 3.1415927.

To convert the result of the ATN function from radian measure to degrees the value returned is multiplied by $180/\pi$, (i.e. 57.2957795). For example, the command

```
PRINT ATN (10)
```

prints the arctangent of 10 in radians. The command,

```
PRINT ATN (10) * 57.2957795
```

will print on the terminal the arctangent of 10 in degrees.

ABS(X)	Returns the absolute value of X.
ATN(X)	Returns the arctangent of the value X in radian measure.
COS(X)	Returns the cosine of the radian value X.
EXP(X)	Returns the constant 'e' (2.72828) raised to the power of X.
INT(X)	Returns the larget integer value of X.
LOG(X)	Returns the natural logarithm of the value X.
RND(X)	Returns pseudo-random numbers.
SGN(X)	Returns an indication of the sign of X.
SIN(X)	Returns the sine of the radian value X.
SQR(X)	Returns the square root of X.
TAB(X)	Positions output to the terminal beginning at column X on the output line.
TAN(X)	Returns the tangent of the radian value X.

Table 1. Common Math and Print Functions.

The ATN Function is the inverse of the TAN (Tangent) function. This is shown by the following short program:

```
10 PRINT "ATN(10) = " ; ATN(10)
20 PRINT "TAN(ATN(10)) = " ; TAN(ATN(10))
30 END
```

The expression 'TAN(ATN(10))' will evaluate to 10 because of the inverse relationship between the ATN and TAN functions.

COS Function

The COS (Cosine) function requires an angular argument in radian measure and returns the cosine of the angle. To convert an angle from degrees to radian measure so that it can be used as an argument to the COS function, the angle in degrees is multiplied by the ratio $\pi/180$ (i.e. 0.0174533).

For example, the command PRINT COS (45 * 0.0174533) will print the cosine of the 45 degree angle.

SIN Function

The SIN (Sine) function requires an angular argument in radian measure and returns the sine of the angle. The same method as described above can be used to convert an angle from degrees to radians. For example, the command PRINT SIN(45* 0.0174533) will print the sine of the 45 degree angle.

TAN Function

The TAN (Tangent) function requires an angular argument in radian measure and returns the tangent of the angle. This is the inverse of the arctangent (ATN) function previously described. For example, to print the tangent of a 30 degree angle the command PRINT TAN (30 * 0.0174533) can be used.

Print Functions

TAB Function

The TAB (Tabular) function is used to position output on the terminal. The argument to the TAB function is numeric and moves the start of printing to the specified column. For example, the command PRINT TAB (20); "MESSAGE" outputs the string MESSAGE beginning at the twenty-first column. On most personal computer systems an output line is divided into 72 columns numbered from 0.

User Defined Functions

BASIC allows the programmer to name and formulate a function using the DEF (Define) statement. The DEF statement has the following format:

line number DEF FNn (x) = expression

For example, you may wish to define a function which would return the area of a circle given the radius. Such a function would be;

10 DEF FNA (x) = 3.1415927 * X↑2 (since area of a circle = πx radius squared).

The function name consists of three letters. The first two F and N must always be present but the last can be any letter from A to Z. This allows defined functions in one program (although some systems allow a letter immediately followed by a single number as a function identifier).

The argument to the function is the 'dummy variable' within the parenthesis (x). This reserves memory space for the arguments given to the function later in the program. Any legal variable name can be used as a dummy variable.

The expression on the right hand side of the equal sign is the calculation the function is to perform. The following program demonstrates how the function would be defined and then used to calculate the area of ten circles:

```
10 REM - CALCULATE AREA OF CIRCLES OF RADIUS 7-10cm
20 DEF FNA (x) 3.1415927 * X ↑ 2
30 PRINT TAB (5); "RADIUS (CM)"; TAB (20); "AREA (CM2)"
40 FOR X = 1 to 10
50 PRINT TAB (8); X; TAB (22); FNA (x)
60 NEXT X
70 END
```

The program is composed of the following lines:

Line 10 - The REM statement outlines the programs function. The characters following REM are ignored by the computer.

Line 20 - This is the function definition. The function is named FNA and is equal to the expression π*X12, where X is the functions argument. It is advisable to place all function definitions at the beginning of a program so that the program is easier to read and follow.

Line 30 - The TAB function is used to format the output to the terminal. The heading 'RADIUS (CM)' will begin at the sixth output line column and 'AREA (CM2)' will begin at the twenty-first column.

Line 40 - The FOR statement intialises the loop index to one and sets the range to ten.

Line 50 - The PRINT statement outputs the value of X (underneath the heading 'RADIUS (CM)' because of the formatting of the TAB function) followed by the value of the area of the circle of radius X computed by the FNA function defined on line 20.

Line 60 - The next statement increments the value of X by one and directs program execution back to line 40.

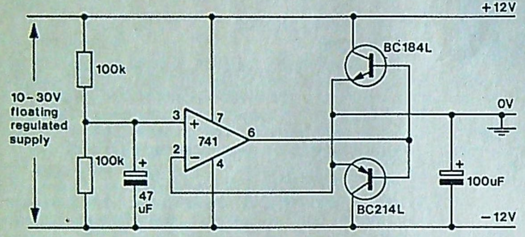
Line 70 - The END statement signifies program completion ■

CIRCUIT MAKER

Single rail to dual rail for op-amps

Most op-amps require a split power supply of some form because both positive and negative output voltage swings are needed. In some applications it is possible to connect the op-amp across a single supply and bias all the inputs up to half the rail voltage but this implies the use of large numbers of DC blocking capacitors. It is more economical and often better to generate a half-rail voltage using another op-amp and if necessary, a couple of transistors. Provided that the input rails are floating from earth the new half-rail voltage may be connected to earth, giving in effect a dual supply with centre earth which is ideal for audio applications.

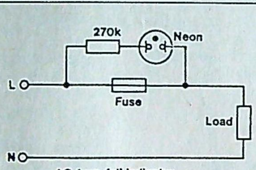
The circuit itself is very obvious. The op-amp is connected as a voltage follower, the input voltage being set at half-rail by the resistor divider and smoothing capacitor. Two transistors are connected to the output of the op-amp to provide current boosting if necessary; the feedback loop being made after these. Note that the maximum voltage supply is limited by the op-amp, in this case 30 volts being the wisest maximum. If the supply is to be used for other op-amps this limit is not relevant.



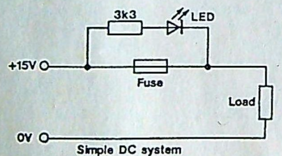
Fuse failure indication

The failure of a fuse either as a result of a fault or simple ageing and over-heating can be quite alarming because the piece of equipment in question usually stops working with no indication as to why. It is thus useful to arrange for some form of indicator to light when a fuse fails. The simplest indicator is for mains when a neon (together with a 270K resistor if not built into the neon) is strapped across the fuse. Obviously when the fuse blows the voltage at the load end drops and the neon lights. The small leakage current through the neon will be of little consequence to the following circuit, even in the event of a major fault. Failures in DC circuits can be a little more tricky depending on the nature of the following circuits. If a current of say 5mA is acceptable, even in event of fuse failure, a LED may be connected across the fuse in the same way as the neon. The polarity of the LED should be altered if the fuse is in a negative supply line. If even low current is not acceptable a transistor must be used to drive the LED. A PNP type for a positive rail system can be connected across the fuse with the base connected to the load side. A LED and suitable resistor are added to the collector. If the fuse fails the base voltage falls, switching on the transistor and causing the LED to light.

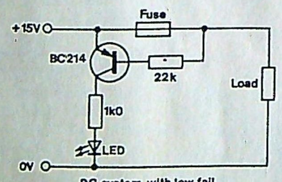
While on the subject of failures, the usefulness of connecting a small neon across the mains supply as soon as it enters a piece of equipment should not be underestimated. Such a neon will give immediate indication as to the state of the mains supply thus saving valuable time if the fault is in the mains lead, as it often is. Such miniature neons are cheap to buy and easy to fit. They also provide an added reminder when servicing that mains is supplied even though the equipment is switched off — something that it is all too easily forgotten.



AC fuse fail indicator



Simple DC system



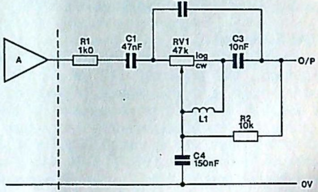
DC system with low fail current through load

Pseudo phaser

Dave Rogers-Walton

Tone stops allow the electronic organ player to select from different fixed filters whilst playing and so are really a type of performance control. There is no reason why a similar facility should not be added to the more usual performance controls (e.g. pitch bend) found on synthesisers. What is needed is some form of one-knob, complex tone control which, unlike standard tone circuits, should be able to shift the balance within the important mid-band as well as at the extremes, so varying the whole character of the sound. The circuit shown does exactly this. It has also been found to have a useful effect at the output of guitar overdrive circuits.

RV1 simultaneously alters the time constants of several high and low-pass signal paths which are then remixed at the output. One of the results of this is the formation of a notch which varies in centre frequency as well as depth, depending or. the setting of RV1. L1 forms resonant circuits with the capacitors over most of RV1s range but is effectively faded out of circuit towards either end, thus adding another variable element to the frequency response contouring.

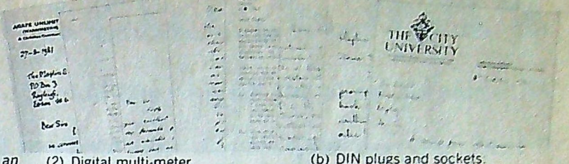


L1 • Choke 1H (HX25C)

Used with a reasonably bright audio input, the perceived loudness is then similar for all settings, so a small turn of this single control can be used to obtain a distinct change in timbre without having to readjust the volume, while a back and forth rotation *during* a sound gives an effect like a manually swept one-notch phaser. A by-pass switch is not needed since with RV1 fully anticlockwise, the tonal response is almost identical to a 'straight through' path.

For best results this circuit must: (1) feed into an impedance of 47k or over, for example, a non inverting op-amp, which if given a gain of x5 will also more than make up for the insertion loss of the passive circuit. (2) be driven from a low impedance stage, designated 'A' in the diagram. This may already exist within a piece of equipment (emitter follower, op-amp, etc) in which case the present circuit can simply be added on passively. If the available output impedance is more than a few hundred ohms, however, a simple buffer stage should be included.

READERS LETTERS



Computer Interface Data Wanted

Dear Sir,

I have just purchased your December/February issue from W. H. Smith and find it very interesting.

I own a micro-computer (Acorn Atom + Via) and like many micro owners have searched in vain for books or magazines which give practical circuits for use with computer outputs and do not require much knowledge of electronics.

I hope therefore that "Electronics" will publish such articles, not only for the Atari but other micros, and am looking forward to your model train controller.

D. M. GRIFFITHS
Nottingham

Bicycle Radio

Dear Sir,

I am a beginner and a few things have got me stumped. Please could you tell me how to make square holes in the front panels of cases. What do you use to cut up Veroboard? In the USA you can buy a "Germanium Crystal Diode". You clip one end to a bike frame, the other to an earphone, and you have a crystal radio. Is this available in the UK? and if so, do you stock it?

DAVID HARRISON
Burgess Hill,
West Sussex

To make square holes, first drill a round one, then file out using a miniature flat warding file. Veroboard can be cut with a sharp knife or deeply scored and snapped off. See our next issue for details of a new book on crystal sets to be published shortly. A suitable diode would be the OA91 with our crystal earpiece. However, don't expect the quality to be to hi-fi standards, though reception of whistles, crackles and other assorted garbage should be excellent. Careful adjustment of the frame should tune different stations, though for best reception of Radio 1 a 70m long bicycle will be needed and these are hard to find (to say nothing of cornering difficulties). Raising or lowering the handlebars could prove to be an excellent fine tune control, though it may be best not to re-tune the radio whilst going along.

Price Increases?

Dear Sir,

I note that your price list is liberally sprinkled with "price reduced" symbols. Very good - but just so we can see what you are really doing, why not add a "price increased" symbol?

R. M. TOBIN
Birmingham, W. Mids

How many times have you seen a shop window with "Price increased" signs on its window amongst the price reduction signs? If you did see a shop like that I'm sure we'd all think they were being very fair. I am also sure that most people would think they were pretty silly as well. You have to remember that as far as mail order is concerned our price list is our shop window.

More Radio Projects

Dear Sir,

Congratulations on an excellent first number.

May I make a suggestion, however, that a proportion, say, up to a quarter of the projects should relate to radio, e.g. a modern communications receiver etc.

L. W. SMITH
Walmer, Kent

Suggestions For Future Projects

Dear Sir,

I'm just writing to let you know how much I enjoyed reading the first issue of "ELECTRONICS" and I am already looking forward to issue No. 2.

May I make a few suggestions for projects in future issues as follows.

(1) Electrified fence pulser (this will prove useful to gardeners pestered with cats)
(2) Digital multi-meter
(3) 900MHz CB rig
(4) 27MHz CB rig
(5) Digital temperature gauge
(6) Frequency meter up to 50MHz with possible range extension up to 900MHz
(7) Digital wind speed indicator

Wishing you every success with future issues.

F. J. BROWN
Wirral, Merseyside

Multicolour LED Can Be Improved

Dear Sir,

Congratulations on your new magazine - good for Maplin customers who are not necessarily music makers! A pity it is not a monthly.

I have a tip for users of the original multicolour LED (which has gone up by 52% in one go - is this fair?) a much better effect is obtained by painting the surface with two coats of enamel matt varnish. This diffuses the outcoming light very well.

Keep up the good work.

C. W. DUDLEY
Bromley, Kent

The new price of this LED is in fact the price it should always have been, but the manufacturer misquoted us on our first shipment and we passed on this error to keep the price down.

More Suggestions For Stock And Projects

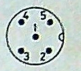
Dear Sir,

Suggestions for stock items:

(a) To enable readers of book XW07H "How to Build Your Own Solid State Oscilloscope", to construct this item, it would be advantageous to be able to purchase the cathode ray tubes and their bases, or even a complete kit, through Maplin. It will be seen that the book is currently number 3 in the Top Twenty. The smaller of the two oscilloscopes has also been deleted from the Maplin catalogue.

(b) DIN plugs and sockets.

Add a further 5-pin configuration as projects in future issues as follows:—



These plugs and sockets are in common use in Philips equipment.

Suggestions for project articles in Maplin Publications:

(a) Passive Infra Red Movement Detector Alarm System.
(b) Microwave.

E. J. T. HITCHIN
Dartford, Kent

Maplin Mag Disliked

Dear Sir,

I expect you are interested in reactions to your new magazine "Electronics" which replaces the newsletters, and whose first issue has arrived.

For my part, it is not of much interest to have yet another magazine of relatively low-grade technical difficulty. Nor am I interested in your other music-orientated magazine.

On the other hand, your components catalogue is important to me, and to be able to obtain the up-to-date price lists by sending a stamped-addressed envelope (or by paying £1.00) was perfectly satisfactory.

However, let the first year's subscription stand, but I shall probably not renew it.

Your components service is first-rate, and highly regarded.

J. R. BARKER
Bath, Avon

We ought to point out that the price list is still available by sending an sae or by paying £1 in advance for seven issues.

If you have any interesting comments to make about your hobby in general or Maplin in particular then please write to: The Editor, Maplin Mag, P.O. Box 3, Rayleigh, Essex SS6 8LR. Please write clearly and keep your letters brief and to the point. Thank you.

NEW ITEMS USED IN PROJECTS IN THIS MAGAZINE

GA04E	Stopwatch PCB	**Price £2.95**	LW63T	Train Receiver 1-ML926 Kit	**Price £5.95**
GA44X	Burglar Alarm PSU PCB	**Price £2.40**	LW64U	Train Receiver 2-ML926 Kit	**Price £5.95**
GA45Y	Burglar Alarm Main PCB	**Price £6.75**	LW65V	Stopwatch Kit	**Price £34.95**
GA46A	Break Contact PCB	**Price £1.95**	LW67X	MPG Meter Kit	**Price £44.95**
GA47B	External Horn PCB	**Price £1.60**	LW68Y	Train Receiver 1-ML927 Kit	**Price £5.95**
GA72P	Train Common PCB	**Price £2.90**	LW69A	Train Receiver 2-ML927 Kit	**Price £5.95**
GA73Q	Train Control PCB	**Price £2.20**	QR56L	2SA715	**Price 45p**
GA74R	Train Receiver 1 PCB	**Price £1.35**	QR57M	ML926	**Price £2.45**
GA75S	Train Receiver 2 PCB	**Price £1.35**	QR58N	ML927	**Price £2.45**
GA76H	MPG Meter Main PCB	**Price £2.45**	QR59P	2SC1162	**Price 45p**
GA77J	MPG Meter Display PCB	**Price £1.75**	XG06G	Burglar Alarm Box	**Price £12.50**
LW57M	Burglar Alarm Kit	**Price £44.95**	XG07H	External Horn Box	**Price £14.50**
LW58N	External Horn Kit	**Price £29.95**	XG09K	Train Control Case	**Price £12.50**
LW59P	Break Contact Kit	**Price £2.99**	XG14Q	Electronic Siren	**Price £19.95**
LW61R	Train PSU/Common Kit	**Price £27.50**	XX45Y	Switchpot 1 pole 12 way	**Price 85p**
LW62S	Train Control Kit	**Price £6.45**	XX47B	Train Control Front Panel	**Price £3.75**

PRICE LIST

All prices shown in this list are valid from 15th February 1982 to 15th May 1982

Please note new telephone number for Sales Only (0702) 552911

Prices shown in this list include VAT at 15% where applicable. Items marked *NV* are rated at 0% and the price shown applies both to inland and export orders. Overseas customers should add up the total cost of all items except those marked *NV* and deduct 13% to arrive at the total price excluding VAT. Alternatively multiplying the total price (except *NV* items) by 0.87 will give the total price excluding VAT.

Although postage charges to customers living in the Republic of Ireland and in the UK, but not on the UK mainland, are the same as to mainland addresses we regret that we must levy an additional charge of £5 on each order containing any items marked "Delivery by Carrier".

Will customers from the Republic of Ireland please add 40p and then 35% to the cost of their order now that the Irish pound is not equivalent to sterling, to cover the rate difference and negotiation fees. We will refund any difference; please state cheque or credit note. Alternatively if you pay by bank draft drawn in pounds sterling on a London bank, then you need add nothing extra. Bank drafts drawn in pounds sterling on a London bank should be readily available from your local bank.

All prices are for the unit quantity shown in the catalogue (unless shown otherwise on this list) i.e. each, per pack, per metre etc. All prices include postage and packing. There is a 30p handling charge which must be paid on all orders having a total value of under £4.00.

The price list is intended for use with our 1981 catalogue and applies to all mail orders. Prices in our shop are generally lower on heavy items as mail order prices include postage and packing costs.

Copies of manufacturers' data sheets are available for most IC's — price 40p each.

Notes:

NYA	Not yet available
NA	Not available
DIS	Discontinued
TEMP	Temporarily out of stock
OOP	Out of print
FEB	Out of stock, new stock expected in month shown
†	While stocks last
*	Item is mentioned in "Amendments to Catalogue" elsewhere in this newsletter
NV	Indicates that item is zero rated for VAT purposes
■	Price reduced

Prices charged will be those ruling on the day of despatch

1981 Catalogue Page No.		VAT inclusive PRICE
Page 11		
TS08J	Parts T-Shirt LC	DIS
TS09K	Parts T-Shirt S	£3.95
TS10L	Parts T-Shirt M	£3.95
TS11M	Parts T-Shirt L	£2.95
XF30H	Pirate Attack Poster	£1.00NV
XF12N	Maplin Poster	£1.00NV
AERIALS		
Page 15		
XQ22Y	Mushkiller FM224	£12.25
XQ23A	Mushkiller FM234T	£16.50
XQ24B	Mushkiller FM235T	£17.60
XQ25C	Mushkiller FM244T	£17.80
XQ27E	Mushkiller FM264T	£24.50
XQ28F	Mushkiller FM284T	£30.50
XQ29G	Trucolour TC10 Grp A	£10.50
XQ30H	Trucolour TC10 Grp B	£9.40
XQ31J	TrucolourTC10 GrpC/D	£9.95
XQ32K	Trucolour TC13 Grp A	£11.85
XQ33L	Trucolour TC13 Grp B	£10.90
XQ34M	TrucolourTC13 GrpC/D	£11.45
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XQ36P	Trucolour TC18 Grp B	£13.85
XQ37S	TrucolourTC18 GrpC/D	£13.25
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XQ39N	Extragain XG8 GroupA	£21.30
XQ40T	Extragain XG8 GroupB	£21.50
XQ41U	Extragain XG8 GrpC/D	£20.50
XQ42V	Extragain XG8 Wdbnd	£21.95
XQ43W	ExtragainXG14 GroupA	£35.50
XQ44X	ExtragainXG14 GroupB	£36.35
XQ45Y	ExtragainXG14 GrpC/D	£34.85
XQ46A	Extragain XG14 Wdbnd	£35.95
XQ47B	ExtragainXG21 GroupA	£47.90
XQ48C	ExtragainXG21 GroupB	£47.90
XQ49D	ExtragainXG21 GrpC/D	£47.90
XQ50E	Extragain XG21 Wdbnd	£47.90
XQ51F	Super-Set Top	£8.95
XY30H	Toptenna	£5.55■
XQ52G	Caratenna CA7	£9.50
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BW42V	Univ Clamp Type 1	£1.95
BW43W	Mast Bracket Type 2	£2.55
XQ53H	Mast Bracket Type 3	£8.50
XQ54J	Mast Bracket Type 8	£12.75
BW44X	Mast Bracket Type 14	£4.65
BW45Y	Loft Bracket EM4	£2.65
XQ55K	Lashing Kit Type 4	£9.85
XQ56L	Lashing Kit Type 6	£15.95
XQ57M	Lashing Kit Type 7	£14.90
XQ58N	Lashing Kit Type 9	£11.50
XQ59P	Mast C	£3.95
XQ60Q	Mast D	£3.75
XQ61R	Mast E	£7.45
XQ62S	Mast G	£15.95
XQ63T	Mast M	£5.79
XQ64U	Mast R	£9.45
*BW46A	Masthead UP1300/W	£10.90■
*BW47B	Now Same As BW46A	
*BW48C	Now Same As BW46A	
*BW49D	Masthead UP1300/V	£10.95■
Page 18		
*BW50E	Power Unit PU1240	£14.65
YQ22Y	Xtra Set Amp	£14.45
YX73Q	XtraBoost Amp	£15.80
RW36P	Plugpak 200	88p
BW51F	Diplexer UF2	£5.55■
BW52G	Splitter CS100	£8.95
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HX88V	Aerial Splitter SB11	£3.20
YQ23A	Splitter CS200	£4.45
Page 19		
HX87U	Surface Co-Ax Outlet	75p
BW54J	Sfce Dble Co-Ax Otlt	£2.70
BW55K	Flush Co-Ax Outlet	75p
BW56L	Flsh Dbl Co-Ax Outlt	£2.65
BW57M	TV/FM Outlet	£4.65
BW58N	Aerial Switch	£4.35
LB09K	75/300 Balun	£1.30
BW59P	Attenuator 6dB	£1.95
BW60Q	Attenuator 12dB	£1.95
BW61R	Attenuator 18dB	£1.95
LB11M	FM Tape Aerial	60p
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YG21X	Ferrite Rod 814	38p
YG22Y	Ferrite Rod 101	45p
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Page 20		
LB12N	MW/LW Aerial	£2.35
*LB10L	Telescp Aerial 54in	£3.30
XB54J	Aerial Rotator	£59.90
YB00A	Low-Pass RF Filter	£4.45
YB01B	RF Antenna Switch	£6.34
YG15R	2m Rubber Duck	£4.75
YG16S	Mag Mount	£8.50
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YG01B	Ni Cad SC	£2.50
YG02C	Ni Cad C	£3.95
YG03D	Ni Cad D	£5.99
WY22Y	Ni-Cad Charger	£7.85
HF27E	Clips PP9	10p■
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YR60Q	3V Batt Box	15p■
YR61R	4.5V Batt Box	30p
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YR62S	Long 9V Batt Box	32p
HF95D	HP11 Batt Box	37p
HF96E	Long HP11 Batt Box	45p
HF97F	HP2 Batt Box	79p
*YB22Y	AC Adaptor 3DC	£4.45
*XX09K	AC Adaptor BR300	£4.75
YB23A	AC Adaptor MVA31	£9.95
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RH24B	Book BP31	DIS
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XW31J	Book MM639	£1.95NV■
XW12N	Book NB386	£4.10NV
RH65V	Book NB048	£3.90NV
XW00A	Book FT882	£6.10NV
RL13P	Book NB099	£2.55NV
XW21X	Book NB344	£5.65NV
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RL06G	Book NB0740	£4.25NV
RH05F	Book BP7	50pNV
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RH04E	Book BP6	85pNV
RQ23A	Book BP53	£3.20NV
RH21X	Book BP27	65pNV■
RH32K	Book BP196	OOP
RH53H	Book BP160	MAY 82
XX10L	Basic Electronic Set	£11.75NV
XW53H	Book NB454	£3.75NV
XW63T	Book JM671	£2.95NV
RL19V	Book NB126	£4.55NV
XW64U	Book NB449	£4.55NV
RR06G	Book NB209	£6.75NV
RH63T	Book NB041	£2.75NV
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RH11M	Book BP14	£2.15NV
RH44X	Book BP211	£1.55NV
RQ68Y	Book FT938	£4.25NV
RQ24B	Book BP41	£3.25NV
RQ69A	Book FT986	£7.75NV
RF11M	Book BP40	JULY
RH35Q	Book BP202	£1.75NV
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RL25L	Book NB145	£4.35NV
RR17T	Book NB327	£6.65NV
RR26D	Book NB1619	£2.75NV
RL03D	Book NB061	DIS
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RQ26D	Book NB319	TEMP
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RL08J	Book NB077	OOP
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RB25C	Book BP225	£1.45NV
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RR37S	Photocell Apps Book	£4.15NV
RF12N	Book BP42	95pNV
LY05F	Book BP45	JUNE
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XW96E	Book FT933	£2.05NV
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Page 31		
RH59P	Book NB016	£4.50NV
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RL18U	Book NB116	DIS
RL24B	Book NB144	£5.50NV
XW88V	Book AG569	£3.70NV
XW32K	Book BP70	60pNV
RQ59P	Book NB367	£2.75NV
RQ31J	Book NB268	£9.20NV
LW28F	Book BP46	£1.60NV
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XW84F	Book AG353	£6.25NV
RL10L	Book NB084	£4.45NV
RL14Q	Book NB101	£4.45NV
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RQ32K	Book NB228	OOP
RL15R	Book NB102	OOP
XW29G	Book NB378	£6.30NV
Page 32		
RH62S	Book NB033	£8.77NV
RL12N	Book NB089	£11.55NV
RL21X	Book NB134	£11.45NV
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RL23A	Book NB137	£9.45NV
RH27E	Book BP34	£1.70NV
RQ75S	Book FT1028	£5.95NV
RQ74R	Book FT780	OOP
RL11M	Book NB085	DIS
RR12N	Book NB236	OOP
RF14Q	Book NB274	£4.40NV
RL22Y	Book NB136	£2.75NV
RL28F	Book NB150	£10.25NV
XW13P	Book NB429	£7.25NV
RH46A	Book BP214	£1.05NV
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Page 33		
XW26D	Book NB336	£8.65NV
RH41U	Book BP208	95pNV
LW29G	Book BP47	£1.50NV
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XW83E	Book AG512	£5.95NV
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RQ79L	Book FT546	£4.85NV
XW55K	Book AG695	£5.15NV
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XW40T	Book BP74	£2.05NV
RQ78K	Book FT503	OOP

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RH38R	Book BP205	£1.15NV
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RF07H	Book BP38	90pNV
RQ37S	Book BP54	£1.65NV
XW95D	Book FT1088	£6.45NV
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XW33L	Book BP66	£2.05NV
XW45Y	Book BP72	£1.95NV
RQ08J	Book Sybex L4	OOP
XW25C	Book NB414	£3.95NV
XW41U	Book ITN1	£5.25NV
RQ40T	Book HD678	£7.55NV
RQ01B	Book Sybex C201	£12.75NV
XW14Q	Book MM604	£5.75NV
RQ00A	Book Sybex C200	£8.15NV
RQ12N	Book Sybex M1	£7.75NV

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RQ13P	Book Sybex M11	£11.35NV
RQ14Q	Book Sybex M12	OOP
XW98G	Book FT1070	£7.85NV
RQ02C	Book Sybex C207	£13.25NV
RQ49D	M6800 Applications	OOP
RQ48C	8085 Systems Manual	DIS
RQ54J	Z80 Data	£3.45NV
XW65V	Book BP78	£2.05NV
XW15R	Book HD813	£3.75NV
RQ62S	Book R3	DIS
RQ60Q	Book R1	£8.95NV
RQ61R	Book R2	£8.95NV
RQ44X	Book HD761	£9.10NV
XW57M	Book HD177	£5.75NV
XW19V	Book HD166	£6.15NV
XW03D	Book FT574	OOP
XW79L	Book C300	£12.45NV
XW80B	Book C202	£11.45NV
XW81C	Book D302	£10.25NV
RQ56L	M6800 Programming	DIS

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XW70M	Book M3	£12.75NV
RQ16S	Book Sybex M14	OOP
RQ06G	Book Sybex L2	£9.24NV
RQ46A	8080 Assemblr Manual	DIS
XW69A	Book M2	£12.75NV
RQ15R	Book Sybex M13	£6.95NV
RQ07H	Book Sybex L3	£9.09NV
RQ11M	Book Sybex L7	OOP
RQ10L	Book Sybex L6	OOP
RQ09K	Book Sybex L5	OOP
RL39N	Book Sybex L8	£4.15NV
XW71N	Book M4	£13.25NV
XW72P	Book C280	£14.35NV
RQ17T	Book Sybex M15	£7.83NV
XW78K	Book C281	£11.70NV
XW58N	Book NB415	£4.25NV
RQ41U	Book NB528	£6.60NV
XW16S	Book FT952	£6.95NV
XW49D	Book MM304	£3.95NV
XW50E	Book MM286	£5.50NV
RL45Y	Book HD106	£10.45NV

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RQ42V	Book HD585	£8.25NV
XW04E	Book FT1055	£3.85NV
XW42V	Book HD115	£5.25NV
RQ43W	Book HD682	£6.60NV
XW24B	Book HD124	£5.80NV
XW59P	Book HD154	£8.65NV
XW60Q	Book HD762	£7.85NV
XW94C	Book FT1095	£3.96NV
RQ64U	Book Sybex P10	£9.20NV
RL48C	Book HD112	£6.70NV
RQ63T	Book R5	OOP
RQ21X	Book Sybex R4	£6.92NV
XW48C	Book R6	£6.84NV
RL47B	Book HD109	£7.45NV
XW18U	Book HD170	£5.48NV
XW05F	Book FT1085	£4.95NV
XW75S	Book FT1062	£4.45NV
XW61R	Book HD160	£5.80NV
XW23A	Book HD155	£13.65NV
RL37S	Book Sybex L9	DIS
XW82D	Book G402	£11.35NV

BOXES

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LH56L	Potting Box Min	10p
LH57M	Potting Box Small	19p
LH58N	Potting Box Medium	25p
LH59P	Potting Box Large	28p
LF01B	Box PB1 White	£1.45
•LH14Q	Box PB1 Grey	£1.55
LH20W	ABS Box MB1	£1.10
LH21X	ABS Box MB2	£1.20
LH22Y	ABS Box MB3	£1.45
LH23A	ABS Box MB4	£3.25
WY03D	ABS Box 2002	£1.15
LH60Q	ABS Box 2004	£1.60
LH61R	ABS Box 2005	£1.90
LH62S	ABS Box 2006	£3.35
LH63T	ABS Console M1005	£2.40
LH64U	ABS Console M1006	£3.90
LH65V	ABS Console M6005	£2.75
LH66W	ABS Console M6006	£3.55
LH67X	ABS Console M6007	£4.95

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LH68Y	ABS Console M8005	£4.55
LH69A	ABS Console M8007	£6.85
WY00A	Metal Panel Bx M4003	£1.50
WY01B	Metal Panel Bx M4004	£1.85
WY02C	Metal Panel Bx M4005	£2.65
YR72P	Pcb Guide Adaptor	18p
LH09K	Foot Sw Box	£4.75
LF03D	Box PB301	£1.85

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HQ45Y	Tilt Leg Small	£1.25
HQ46A	Tilt Leg Medium	£1.22

1981 Catalogue Page No.		VAT inclusive PRICE
HQ47B	Tilt Leg Large	£1.50
LH00A	Verobox 101	£4.25
LH01B	Verobox 102	£4.85
LL00A	Verobox 103	£5.75
LL01B	Verobox 104	£12.95
LL02C	Verobox 105	£6.39
LL03D	Verobox 106	£3.25
LL04E	Verobox 107	£3.55
LL05F	Verobox 201	£5.35
LL06G	Verobox 202	£6.25
LL07H	Verobox 203	£7.95
LL08J	Verobox 211	£4.35
LL09K	Verobox 212	£5.25
LL10L	Verobox 213	£5.49
LQ07H	Verobox 214	£5.25
LQ08J	Verobox 215	£5.95■
LQ09K	Verobox 216	£5.49
LL11M	Verobox 217	£5.55
LH24B	Verobox 221	£3.75
LH25C	Verobox 222	£4.95
LH26D	Verobox 223	£4.65
LL12N	Verobox 301	68p
LL13P	Verobox 302	68p
LH50E	Verobox 303	£1.45
LH51F	Verobox 305	£2.15
LL14Q	Verobox 401	95p■
XB88V	Verocase 501	£14.95
XB89W	Verocase 502	£29.95
XY15R	Verobox 503	£15.20
LQ03D	Flip-Top Box 601 Blk	£3.55
LQ05F	Flip-Top Box 602 Blk	£5.25
LH27E	Verobox 701	£5.35
LH28F	Verobox 702	£5.55
LH29G	Verobox 704	£7.95
LH30H	Verobox 705	£7.25
LH31J	Verobox 707	DIS
LH32K	Verobox 708	DIS
LH33L	Verobox 713	DIS
LH34M	Verobox 716	DIS
LH35Q	Verobox 719	£9.65

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LF08J	Box AB7	£1.25
LF09K	Box AB8	£1.25
LF10L	Box AB9	£1.15
LF11M	Box AB10	£1.35
LF12N	Box AB11	£1.15
LF13P	Box AB12	90p
LF14Q	Box AB13	£1.65
XB71N	Box AB15	£3.25
LF15R	Box AB23	£1.65
LF16S	Box AB24	£1.75
LH10L	Box AB28	£1.50
XB69A	Box AB31	£2.25
XB56L	Chassis AC64	£2.10
XB68Y	Chassis AC86	£3.25
LF02C	Case WB1 Vinyl	£1.90
LH37S	Case WB2 Vinyl	£2.80
LH38R	Case WB3 Vinyl	£3.45
LH39N	Case WB4 Vinyl	£3.95
LH40T	Case WB5 Vinyl	£4.95
LH41U	Case WB6 Vinyl	£6.25
LH42V	Case WB7 Vinyl	£6.95
LH43W	Case TP1 Teak	£1.85
LH44X	Case TP2 Teak	£2.85
LH45Y	Case TP3 Teak	£3.55
LH46A	Case TP4 Teak	£4.20
LH47B	Case TP5 Teak	£4.95
LH48C	Case TP6 Teak	£6.45
LH70M	Box DCM5002	£2.40
LH71N	Box DCM5004	£3.25
LH72P	Box DCM5007	£4.55
LH73Q	Box DCM5005	£4.40
LH74R	Box DCM5006	£5.75
XQ08J	G-Range 2A	£10.95
XQ09K	G-Range 3G	£14.40
XQ10L	G-Range 4B	£21.95

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XY61R	Centurion DX1	£6.95
XY62S	Centurion DX2	£7.85
XY63T	Centurion DX3	£8.65
XY64U	Centurion WX3	£11.95
XY65V	Centurion WX4	£13.25
XY66W	Centurion DX4	£9.85
XY67X	Centurion DX5	£10.45
XY68Y	Centurion DX6	£11.95
XY69A	Centurion WX1	£14.65
XY70M	Centurion WX2	£14.95
XQ11M	Centurion EX1H	£12.74
XQ12N	Centurion EX2H	£13.85
XQ13P	Centurion EX3H	£14.95
XQ14Q	Centurion EX4H	£16.50
XY59P	Console 103	£10.95
XY60Q	Console 108.	£16.45

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XB73Q	Blue Case 227	£4.55
XY40T	Blue Case 230	£4.95
XY41U	Blue Case 235	£5.40
XY42V	Blue Case 209	£4.65
XY43W	Blue Case 212	£5.35
XY44X	Blue Case 231	£5.95
XB67X	Blue Case 236	£6.45
XY45Y	Blue Case 222	£5.85
XY46A	Blue Case 226	£6.85
XB70M	Blue Case 232	£6.45■
XY47B	Blue Case 237	£7.90
XY48C	Blue Case 233	£7.70
XY49D	Blue Case 238	£9.80
XY50E	Wood-End Case 625	£10.45
XY51F	Wood-End Case 635	£11.45
XY52G	Wood-End Case 645	£12.30
XY53H	Wood-End Case 926	£13.90
XY54J	Wood-End Case 936	£14.95
XY55K	Wood-End Case 947	£16.50
XY56L	Wood-End Case 1426	£16.50
XY57M	Wood-End Case 1437	£18.95
XY58N	Wood-End Case 1449	£22.80
XY38R	19 in. Card Frame	£35.50
XY39N	19 inch Frame Case	£24.95
YR49D	3E Front Panel	£4.25
YR50E	6E Front Panel	£4.65
YR51F	12E Front Panel	£4.95
YR52G	24E Front Panel	£7.35

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LH52G	3E Module	£6.49
LH53H	6E Module	£6.79
LH54J	12E Module	£9.93
LH55K	24E Module	£12.93
YR54J	Eurocard Guide	22p
YR55K	Mod Int Card Guide	22p

1981 Catalogue Page No.		VAT inclusive PRICE
FW19V	Feet Cab	8p
FW38R	Stick-on Feet	18p
FW39N	HD Feet	10p
HH23A	Recess Plate	8p
YR53H	Card Frame Brackets	50p
YR56L	Card Frame Heat Sink	£1.69
FX96E	Castors	£2.75
FX05F	Castor Cup	49p
XY31J	Piano Legs	£24.50

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FX06G	Cool Grille	32p
FW81C	Handle	64p
FW82D	HD Strap Handle	£1.55
FX03D	Inst Handle PLastic	59p
FX00A	Inst Handle Small	£2.68
FX01B	Inst Handle Large	£2.75
FX02C	Ferrule	31p
LH08J	Recess Handle	40p■
LH11M	Heavy Duty Handle	£2.59
YL05F	Flip Handle	£4.95
YX00A	Cab Corners Small	20p
FX04E	Cab Corner Large	12p
FX94C	Corner Two-Side	29p
FX95D	Corner Three-Side	36p
HB20W	Flexihinge	8p
YL24B	Small Hinge	£1.55

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YL04E	Lift off Hinge	£1.85■
YL25C	Lockable Catch	£1.98
YL06G	Butterfly Catch	£4.79
*XY17T	Laminate Japan Teak	£3.75
*XY18U	Laminate Penang W/Nu	£3.75
XY19V	Laminate Alum Small	£1.59
XY20W	Laminate Alum Large	£2.11
RY00A	Black Tygan 45in.	£1.96
RY01B	Black Tygan 22.1/2in	98p
RY02C	Brown Tygan 45in.	£1.96
RY03D	Brown Tygan 22.1/2in	98p
RY04E	Covering Cloth 50in.	£1.06
RY05F	Covering Cloth 25in.	53p
RY06G	Acoustic Wadding	65p

CABLES

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BL77J	Wire-Wrap Black	£1.85
BL78K	Wire-Wrap Blue	£1.85
BL79L	Wire-Wrap Green	£1.85
BL80B	Wire-Wrap Natural	DIS
BL81C	Wire-Wrap Orange	£1.85
BL82D	Wire-Wrap Red	£1.85
BL83E	Wire-Wrap White	£1.85
BL84F	Wire-Wrap Yellow	£1.85
BL85G	Bell Wire Black	50p
BL86T	Bell Wire Blue	50p
BL87U	Bell Wire Brown	50p
BL88V	Bell Wire Green	50p
BL89W	Bell Wire Grey	50p
BL90X	Bell Wire Orange	50p
BL91Y	Bell Wire Pink	50p
BL92A	Bell Wire Red	50p
BL93B	Bell Wire Violet	50p
BL94C	Bell Wire White	50p
BL95D	Bell Wire Yellow	50p
BL46A	L/C Wire Black	£1.18
BL47B	L/C Wire Blue	£1.18
BL48C	L/C Wire Brown	£1.18
BL49D	L/C Wire Green	£1.18
BL50E	L/C Wire Grey	£1.18
BL51F	L/C Wire Orange	£1.18
BL52G	L/C Wire Pink	£1.18
BL53H	L/C Wire Red	£1.18
BL54J	L/C Wire Violet	£1.18
BL55K	L/C Wire White	£1.18
BL56L	L/C Wire Yellow	£1.18
BL00A	Wire 10M Black	35p
BL01B	Wire 10M Blue	35p
BL02C	Wire 10M Brown	35p
BL03D	Wire 10M Green	35p
BL04E	Wire 10M Grey	35p
BL05F	Wire 10M Orange	35p
BL06G	Wire 10M Pink	35p
BL07H	Wire 10M Red	35p
BL08J	Wire 10M Violet	35p
BL09K	Wire 10M White	35p
BL10L	Wire 10M Yellow	35p
XL10L	Wire 11C	£3.75
YR00A	Bicol Green/Red	34p
YR01B	Bicol Green/Yellow	34p
YR02C	Bicol Grey/Black	34p
YR03D	Bicol Grey/Blue	34p
YR04E	Bicol Orange/Black	34p
YR05F	Bicol Orange/Red	34p
YR06G	Bicol Pink/Black	34p
YR07H	Bicol Purple/Red	34p
YR08J	Bicol Red/Black	34p
YR09K	Bicol Red/Blue	34p
YR10L	Bicol Red/Brown	34p
YR11M	Bicol Red/Green	34p
YR12N	Bicol White/Black	34p
YR13P	Bicol White/Red	34p
YR14Q	Bicol Yellow/Black	34p
YR15R	Bicol Yellow/Green	34p
YR16S	Bicol Yellow/Red	34p
XR32K	Wire 3202 Black	17p
XR33L	Wire 3202 Blue	17p
XR34M	Wire 3202 Brown	17p
XR35Q	Wire 3202 Green	17p
XR36P	Wire 3202 Red	17p
XR37S	Wire 3202 White	17p
XR38R	Wire 3202 Grn/Yllw	17p

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XR57M	HC Wire Black	38p
XR58N	HC Wire Green	38p
XR59P	HC Wire Red	38p
XR40T	Extra Flex Black	16p
XR41U	Extra Flex Blue	16p
XR43W	Extra Flex Green	16p
XR44X	Extra Flex Red	16p
XR45Y	Extra Flex Yellow	16p
XR22Y	EHT Wire	32p
BL11M	Strappg Wire 16swg	82p
BL12N	Strappg Wire 18swg	87p
BL13P	Strappg Wire 20swg	£1.15
BL14Q	Strappg Wire 22swg	94p
BL15R	Strappg Wire 24swg	96p
BL16S	EC Wire 14 swg.	70p
BL24B	EC Wire 16 swg.	79p
BL25C	EC Wire 18 swg.	88p
BL26D	EC Wire 20 swg.	89p
BL27E	EC Wire 22 swg.	93p
BL28F	EC Wire 24 swg.	£1.05

1981 Catalogue Page No.		VAT inclusive PRICE
BL29G	EC Wire 26 swg.	£1.07
BL39N	EC Wire 28 swg.	£1.07
BL40T	EC Wire 30 swg.	£1.10
BL41U	EC Wire 32 swg.	£1.12
BL42V	EC Wire 34 swg.	£1.16
BL43W	EC Wire 36 swg.	£1.25
BL44X	EC Wire 38 swg.	£1.25
BL60Q	EC Wire 40 swg.	£1.50
BL61R	EC Wire 42 swg.	£1.49
BL62S	EC Wire 44 swg.	£2.20
BL63T	EC Wire 48 swg.	£4.95
XR39N	Zip Wire	14p
XR60Q	HD Loudspeaker Cable	36p
YG08J	Litz Speaker Leads	£8.99
XR06G	Ribbn Cable 10-Way	60p
XR07H	Ribbn Cable 20-Way	£1.20
XR65V	IDC Cable 12-Way	£2.11

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XR47B	Twn Mains DS Black	28p
XR00A	Twn Mains DS White	17p
XR61R	Twin 6A Mains Orange	49p
XR62S	Twin 6A Mains White	49p
XR01B	Min Mains Black	35p
XR02C	Min Mains White	36p
XR03D	6A Mains Black	56p
XR04E	6A Mains White	56p
XR05F	6A Mains Orange	70p
XR09K	HD Mains Black	99p
XR10L	HD Mains White	80p
XR11M	HD Mains Orange	90p
XR24B	Cotton Mains	94p
BL71N	Stretchflex 1A	£1.05
BL72P	Stretchflex 6A	£5.95
XR48C	4-Core Mains	£1.05

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XR49D	1.0mm TE Cable	43p
XR50E	1.5mm TE Cable	48p
XR51F	2.5mm TE Cable	65p
XR52G	6mm TE Cable	£1.75
XR53H	1mm Trpl &ECC Cbl	65p
XR15R	Min Screened	15p
XR12N	Cable Single Black	19p
XR13P	Cable Single Grey	19p
XR14Q	Cable Single White	19p
XR16S	Single Mic Cable	42p

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XR18U	Low Noise Scnd	40p
XR19V	Low C Cable	55p
XR63T	UR67 RF Cable	£1.95
XR08J	Twin Mic Cable	78p
XR20W	Lapped Pair	20p
XR21X	Cable Twin	29p
XR23A	Cable Quad	28p
XR25C	Multi-Core 4-Way	60p

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XR26D	Multi-Core 6-Way	65p
XR27E	Multi-Core 9-Way	86p
XR28F	Multi-Core 15-Way	£1.25
XR46A	Multi-Core 25-Way	£1.74
XR54J	Multi-Core 36-Way	£2.31
BH30H	Scr Strtchflx Blck	£1.80
BH31J	Scr Strtchflx Blue	£1.80
BH33L	Scr Stchflx Psychdic	DIS
BH34M	Scr Stretchflex Red	£1.80
HQ49D	Twin Stretchflex	£2.40
XR30H	Standard Co-Ax	48p
XR29G	Low Loss Co-Ax	50p
XR31J	Bal Feeder	19p
YR19V	Marker A0	9p
YR20W	Marker A1	9p
YR21X	Marker A2	9p
YR22Y	Marker A3	9p
YR23A	Marker A4	9p
YR24B	Marker A5	9p
YR25C	Marker A6	9p
YR26D	Marker A7	9p
YR27E	Marker A8	9p
YR28F	Marker A9	9p
YR29G	Marker B0	10p
YR30H	Marker B1	10p
YR31J	Marker B2	9p
YR32K	Marker B3	10p
YR33L	Marker B4	10p
YR34M	Marker B5	10p
YR35Q	Marker B6	10p
YR36P	Marker B7	10p
YR37S	Marker B8	10p
YR38R	Marker B9	10p
YR39N	Marker C0	10p
YR40T	Marker C1	10p
YR41U	Marker C2	10p■
YR42V	Marker C3	10p
YR43W	Marker C4	10p
YR44X	Marker C5	10p
YR45Y	Marker C6	10p
YR46A	Marker C7	10p
YR47B	Marker C8	10p
YR48C	Marker C9	10p

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BF86T	Heat Shrink CP 16	55p
BF87U	Heat Shrink CP 24	65p
BF88V	Heat Shrink CP 32	30p
BF89W	Heat Shrink CP 48	32p
BF90X	Heat Shrink CP 64	34p
YR17T	Heat Shrink CP95	50p■
YR18U	Heat Shrink CP127	£1.10
BL66W	Ht-Resist Sleeve Blk	12p
BL69A	Ht-Resist Sleeve Grn	12p
BL70M	Ht-Resist Sleeve Red	12p
BH00A	Systoflex 1mm Black	6p
BH01B	Systoflex 1mm Blue	6p
BH02C	Systoflex 1mm Green	6p
BH03D	Systoflex 1mm Red	6p
BH04E	Systoflex 1mm White	6p
BH05F	Systoflex 1mm Yellow	6p
BH06G	Systoflex 2mm Black	9p
BH07H	Systoflex 2mm Blue	9p
BH08J	Systoflex 2mm Green	9p
BH09K	Systoflex 2mm Red	9p
BH10L	Systoflex 2mm White	11p
BH11M	Systoflex 2mm Yellow	9p
BH12N	Systoflex 4mm Black	15p
BH13P	Systoflex 4mm Blue	15p
BH14Q	Systoflex 4mm Green	15p
BH15R	Systoflex 4mm Red	15p
BH16S	Systoflex 4mm White	15p
BH17T	Systoflex 4mm Yellow	15p

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BH42V	Systoflex 6mm Black	17p
BH43W	Systoflex 10mm Black	24p
BL65V	Lacing Cord	98p
BL57M	Spirawrap 1/8in.	18p
BL58N	Spirawrap 1/4in.	21p
BL59P	Spirawrap 1/2in.	46p
BF91Y	Tie-Wrap 92	2p■
BF92A	Tie-Wrap 140	3p■
BF93B	Tie-Wrap 186	3½p
BF94C	Cable Tie Base	19p
BH26D	Safix 4	9p
BH27E	Safix 8	10p
BH28F	Safix 12	13p

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LR44X	Cable P Clip 3/16in.	2½p
LR45Y	Cable P Clip 1/4in.	2½p
LR46A	Cable P Clip 5/16in.	3p
LR04E	Cable Clip 3/8in.	3p
BH18U	Hiatt Rd 2.3/4mm	20p
BH19V	Hiatt Rd 3.1/2mm	24p
BH20W	Hiatt Rd 4mm	24p
BH21X	Hiatt Rd 5mm	24p
BH22Y	Hiatt Rd 6mm	25p
BH23A	Hiatt Rd 7mm	28p
BH24B	Hiatt Rd 8mm	28p
BH36P	Hiatt Rd 9mm	37p
BH25C	Hiatt Flat 4mm	20p
BH37S	Hiatt Flat 5mm	23p
BH38R	Hiatt Flat 7mm	27p
BH39N	Hiatt Flat 9mm	32p
BH40T	Hiatt Flat 10mm	32p
BH41U	Hiatt Flat 14mm	38p

CAPACITORS

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WX35Q	Ceramic 1.8	6p
WX36P	Ceramic 2.2	6p
WX37S	Ceramic 2.7	6p
WX38R	Ceramic 3.3	6p
WX39N	Ceramic 3.9	6p
WX40T	Ceramic 4.7	6p
WX41U	Ceramic 5.6	6p
WX42V	Ceramic 6.8	6p
WX43W	Ceramic 8.2	6p
WX44X	Ceramic 10	6p
WX45Y	Ceramic 12	6p
WX46A	Ceramic 15	6p
WX47B	Ceramic 18	6p
WX48C	Ceramic 22	6p
WX49D	Ceramic 27	6p
WX50E	Ceramic 33	6p
WX51F	Ceramic 39	6p
WX52G	Ceramic 47	6p
WX53H	Ceramic 56	6p
WX54J	Ceramic 68	6p
WX55K	Ceramic 82	6p
WX56L	Ceramic 100	6p
WX57M	Ceramic 120	6p
WX58N	Ceramic 150	6p
WX59P	Ceramic 180	6p
WX60Q	Ceramic 220	6p
WX61R	Ceramic 270	6p
WX62S	Ceramic 330	6p
WX63T	Ceramic 390	6p
WX64U	Ceramic 470	6p
WX65V	Ceramic 560	6p
WX66W	Ceramic 680	6p
WX67X	Ceramic 820	6p
WX68Y	Ceramic 1000	6p
WX69A	Ceramic 1200	6p
WX70M	Ceramic 1500	6p
WX71N	Ceramic 1800	6p
WX72P	Ceramic 2200	6p
WX73Q	Ceramic 2700	6p
WX74R	Ceramic 3300	6p
WX75S	Ceramic 3900	6p
WX76H	Ceramic 4700	6p
WX77J	Ceramic 10,000	6p
WX78K	Ceramic 22,000	6p
YY24B	Monocap 0.001uF	19p
YY25C	Monocap 0.0022uF	20p
YY07H	Monocap 0.0047uF	20p
YY08J	Monocap 0.01uF	21p
YY09K	Monocap 0.022uF	25p
YY10L	Monocap 0.047uF	28p
YY11M	Monocap 0.1uF	36p
YR73Q	Minidisc 0.01uF	5p
YR74R	Minidisc 0.047uF	5p
YR75S	Minidisc 0.1uF	7p
YR76H	Minidisc 0.47uF	15p
BX00A	Disc 0.01uF	10p
BX01B	Disc 0.022uF	10p
BX02C	Disc 0.047uF	12p■
BX03D	Disc 0.1uF	12p

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BX05F	HV Disc 10	14p
BX06G	HV Disc 47	19p
BX07H	HV Disc 100	22p■
BX10L	HV Disc 470	11p■
BX12N	HV Disc 1000	11p
BX13P	HV Disc 2200	11p■
BX14Q	HV Disc 4700	22p■
BX15R	HV Disc 10,000	19p
HY18U	1000V Disc 4700pF	18p
BX16S	Feed Thro Cap	8p
WX00A	Mica 2.2pF	27p
WX01B	Mica 3.3pF	27p
WX02C	Mica 5pF	27p
WX03D	Mica 10pF	27p
WX04E	Mica 18pF	27p
WX05F	Mica 22pF	27p
WX06G	Mica 27pF	28p
WX07H	Mica 33pF	28p
WX08J	Mica 39pF	28p
WX09K	Mica 47pF	28p
WX10L	Mica 56pF	28p
WX11M	Mica 68pF	28p
WX12N	Mica 82pF	28p
WX13P	Mica 100pF	28p
WX14Q	Mica 120pF	28p
WX15R	Mica 150pF	28p
WX16S	Mica 180pF	28p
WX17T	Mica 220pF	28p
WX18U	Mica 270pF	49p
WX19V	Mica 330pF	49p
WX20W	Mica 390pF	49p
WX21X	Mica 470pF	49p
WX22Y	Mica 560pF	49p
WX23A	Mica 680pF	51p
WX24B	Mica 820pF	51p
WX25C	Mica 1000pF	56p
WX26D	Mica 1500pF	65p
WX27E	Mica 1800pF	72p

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WX28F	Mica 2200pF	79p
WX29G	Mica 2700pF	92p
WX30H	Mica 3600pF	96p
WX31J	Mica 4700pF	£1.34
WX32K	Mica 6800pF	DIS
WX33L	Mica 8200pF	£2.09
WX34M	Mica 10,000pF	£2.35
BX24B	Polystyrene 22	13p
BX25C	Polystyrene 33	8p
BX26D	Polystyrene 47	8p
BX27E	Polystyrene 68	8p
BX28F	Polystyrene 100	8p
BX29G	Polystyrene 150	8p
BX30H	Polystyrene 220	8p
BX31J	Polystyrene 330	8p
BX32K	Polystyrene 470	8p
BX33L	Polystyrene 560	8p
BX34M	Polystyrene 680	8p
BX35Q	Polystyrene 1000	8p
BX36P	Polystyrene 1500	8p
BX37S	Polystyrene 2200	8p
BX38R	Polystyrene 3300	8p
BX39N	Polystyrene 4700	8p
BX40T	Polystyrene 5600	10p
BX41U	Polystyrene 6800	10p
BX92A	Polystyrene 10,000	14p
BX93B	Polystyrene 22,000	19p
BX94C	Polystyrene 47,000	25p
BX95D	Polystyrene 100,000	49p

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1981 Catalogue Page No.		VAT inclusive PRICE
BX46A	1% Polysty 100	27p
BX47B	1% Polysty 150	27p
BX49D	1% Polysty 220	27p
BX50E	1% Polysty 270	29p
BX51F	1% Polysty 330	29p
BX52G	1% Polysty 390	29p
BX53H	1% Polysty 470	29p
BX54J	1% Polysty 560	29p
BX55K	1% Polysty 750	29p
BX56L	1% Polysty 1000	29p
BX57M	1% Polysty 1200	29p
BX58N	1% Polysty 1500	29p
BX59P	1% Polysty 1800	29p
BX60Q	1% Polysty 2200	29p
BX61R	1% Polysty 2700	29p
BX62S	1% Polysty 3300	29p
BX63T	1% Polysty 3900	29p
BX64U	1% Polysty 4700	37p
BX65V	1% Polysty 5600	37p
BX66W	1% Polysty 6800	37p
BX85G	1% Polysty 8200	37p
BX86T	1% Polysty 10,000	37p
BX87U	1% Polysty 22,000	48p
WW22Y	Carbonate 0.001	9p
WW23A	Carbonate 0.0015	9p
WW24B	Carbonate 0.0022	9p
WW25C	Carbonate 0.0033	9p
WW26D	Carbonate 0.0047	9p
WW27E	Carbonate 0.0068	9p
WW28F	Carbonate 0.0082	9p
WW29G	Carbonate 0.01	9p
WW30H	Carbonate 0.012	9p
WW31J	Carbonate 0.015	9p
WW32K	Carbonate 0.018	9p
WW33L	Carbonate 0.022	10p
WW34M	Carbonate 0.027	11p
WW35Q	Carbonate 0.033	11p■
WW36P	Carbonate 0.039	11p
WW37S	Carbonate 0.047	11p
WW38R	Carbonate 0.056	14p
WW39N	Carbonate 0.068	12p
WW40T	Carbonate 0.082	14p
WW41U	Carbonate 0.1	11p
WW42V	Carbonate 0.12	11p
WW43W	Carbonate 0.15	14p
WW44X	Carbonate 0.18	14p
WW45Y	Carbonate 0.22	16p
WW46A	Carbonate 0.27	16p
WW47B	Carbonate 0.33	24p
WW48C	Carbonate 0.39	24p
WW49D	Carbonate 0.47	25p
WW50E	Carbonate 0.56	27p
WW51F	Carbonate 0.68	36p
WW52G	Carbonate 0.82	38p
WW53H	Carbonate 1	42p
BX70M	Polyester 0.01uF	8p
BX71N	Polyester 0.015uF	8p
BX72P	Polyester 0.022uF	8p
BX73Q	Polyester 0.033uF	9p
BX74R	Polyester 0.047uF	9p
BX75S	Polyester 0.068uF	9p
BX76H	Polyester 0.1uF	9p
BX77J	Polyester 0.15uF	11p
BX78K	Polyester 0.22uF	13p
BX79L	Polyester 0.33uF	18p
BX80B	Polyester 0.47uF	21p
BX81C	Polyester 0.68uF	27p
BX82D	Polyester 1uF	31p
BX83E	Polyester 1.5uF	56p
BX84F	Polyester 2.2uF	64p

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1981 Catalogue Page No.		VAT inclusive PRICE
WW15R	Mylar 0.001	5p
WW16S	Mylar 0.0022	5p
WW17T	Mylar 0.0047	5p
WW18U	Mylar 0.01	6p
WW19V	Mylar 0.022	6p
WW20W	Mylar 0.047	8p
WW21X	Mylar 0.1	10p■
WW83E	Mylar 0.22	16p
FF53H	IS Cap 0.01uF	22p
FF54J	IS Cap 0.022uF	23p
FF55K	IS Cap 0.047uF	23p
FF56L	IS Cap 0.1uF	32p
FF57M	IS Cap 0.22uF	45p
FF58N	IS Cap 0.47uF	78p
†BX22Y	Mx D 0.001uF 1500V	25p
BX42V	Mx D 0.0047uF 1000V	DIS
BX43W	Mix D 0.01 1000V	DIS
†BX44X	Mix D 0.022uF 1000V	56p
BX45Y	Mix D 0.047uF 1000V	DIS
BX67X	Mix D 0.1uF 600V	DIS
†BX68Y	Mix D 0.1uF 1000V	65p
BX69A	Mix D 0.22uF 1000V	DIS
BX90X	Mix D 0.47uF 1000V	DIS
BX91Y	Mix D 1.0uF 600V	DIS
WW54J	Tant 0.1uF 35V	13p
WW55K	Tant 0.15uF 35V	13p
WW56L	Tant 0.22uF 35V	16p
WW57M	Tant 0.33uF 35V	18p
WW58N	Tant 0.47uF 35V	17p■
WW59P	Tant 0.68uF 35V	17p
WW60Q	Tant 1.0uF 35V	18p
WW61R	Tant 1.5uF 35V	18p

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WW62S	Tant 2.2uF 35V	23p
WW63T	Tant 3.3uF 35V	19p■
WW64U	Tant 4.7uF 16V	21p■
WW65V	Tant 4.7uF 35V	23p
WW66W	Tant 6.8uF 16V	21p■
WW67X	Tant 6.8uF 35V	24p
WW68Y	Tant 10uF 16V	25p
WW69A	Tant 10uF 25V	28p
WW70M	Tant 10uF 35V	36p
WW72P	Tant 22uF 16V	39p
WW73Q	Tant 22uF 25V	65p
WW74R	Tant 33uF 10V	32p
WW75S	Tant 47uF 10V	57p
WW76H	Tant 47uF 16V	95p
WW78K	Tant 100uF 3V	35p
WW79L	Tant 100uF 10V	£1.25
YY29G	Minelect 0.1uF 50V	13p
YY30H	Minelect 0.47uF 50V	13p
YY31J	Minelect 1uF 50V	15p
YY32K	Minelect 2.2uF 50V	15p
YY33L	Minelect 4.7uF 25V	21p
YY34M	Minelect 10uF 16V	13p■
YY35Q	Minelect 10uF 25V	16p
YY36P	Minelect 22uF 16V	18p
YY37S	Minelect 47uF 16V	22p

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1981 Catalogue Page No.		VAT inclusive PRICE
FF00A	PC Elect 0.47uF 100V	11p
FF01B	PC Elect 1uF 100V	11p
FF02C	PC Elect 2.2uF 63V	10p■
FF03D	PC Elect 4.7uF 63V	10p
FF04E	PC Elect 10uF 35V	10p■
FF05F	PC Elect 10uF 63V	11p■
FF06G	PC Elect 22uF 16V	10p■
FF07H	PC Elect 22uF 63V	12p
FF08J	PC Elect 47uF 25V	12p
FF09K	PC Elect 47uF 63V	14p
FF10L	PC Elect 100uF 10V	10p
FF11M	PC Elect 100uF 25V	12p
FF12N	PC Elect 100uF 63V	22p■
FF13P	PC Elect 220uF 16V	12p
FF14Q	PC Elect 220uF 63V	33p
FF15R	PC Elect 470uF 16V	20p■
FF16S	PC Elect 470uF 25V	25p■
FF59P	PC Elect 470uF 63V	56p
FF17T	PC Elect 1000uF 16V	27p■
FF18U	PC Elect 1000uF 25V	33p
FF60Q	PC Elect 2200uF 16V	42p
FB11M	Axial 0.47uF 250V	21p
FB12N	Axial 1uF 63V	8p
FB13P	Axial 1uF 450V	25p
FB14Q	Axial 1.5uF 63V	10p■
FB15R	Axial 2.2uF 63V	10p
FB16S	Axial 2.2uF 450V	30p
FB17T	Axial 3.3uF 63V	10p
FB18U	Axial 4.7uF 63V	12p
FB19V	Axial 4.7uF 450V	33p
FB20W	Axial 6.8uF 40V	15p
FB21X	Axial 6.8uF 63V	16p
FB22Y	Axial 10uF 25V	9p
FB23A	Axial 10uF 63V	11p
FB24B	Axial 10uF 100V	18p
FB25C	Axial 10uF 450V	45p
FB26D	Axial 15uF 16V	9p
FB27E	Axial 15uF 40V	11p■
FB28F	Axial 15uF 63V	16p
FB29G	Axial 22uF 10V	10p
FB30H	Axial 22uF 25V	11p
FB31J	Axial 22uF 63V	16p
FB32K	AXial 22uF 100V	24p
FB33L	Axial 22uF 450V	55p
FB34M	Axial 33uF 6.3V	10p■
FB35Q	Axial 33uF 16V	11p
FB36P	Axial 33uF 40V	12p
FB37S	Axial 47uF 4V	14p
FB38R	Axial 47uF 10V	10p
FB39N	Axial 47uF 25V	13p
FB40T	Axial 47uF 40V	14p
FB41U	Axial 47uF 63V	17p
FB42V	Axial 47uF 100V	32p
FB43W	Axial 47uF 450V	85p
FB44X	Axial 68uF 6.3V	15p
FB45Y	Axial 68uF 16V	16p
FB47B	Axial 100uF 6.3V	DIS
FB48C	Axial 100uF 10V	11p
FB49D	Axial 100uF 25V	14p
FB50E	Axial 100uF 40V	18p
FB51F	Axial 100uF 63V	22p
FB52G	Axial 100uF 100V	52p
FB53H	Axial 100uF 250V	85p
FB54J	Axial 150uF 6.3V	18p
FB55K	Axial 150uF 16V	13p
FB56L	Axial 150uF 25V	15p
FB58N	Axial 150uF 63V	32p
FB59P	Axial 220uF 6.3V	DIS
FB60Q	Axial 220uF 10V	12p
FB61R	Axial 220uF 16V	14p
FB62S	Axial 220uF 25V	18p
FB63T	Axial 220uF 40V	27p
FB64U	Axial 220uF 63V	32p
FB65V	Axial 220uF 100V	55p
FB66W	Axial 330uF 6.3V	DIS
FB67X	Axial 330uF 10V	14p
FB68Y	Axial 330uF 25V	20p■
FB69A	Axial 330uF 63V	44p
FB70M	Axial 470uF 6.3V	15p
FB71N	Axial 470uF 10V	22p
FB72P	Axial 470uF 16V	26p■
FB73Q	Axial 470uF 25V	30p
FB74R	Axial 470uF 63V	55p■
FB75S	Axial 470uF 100V	89p
FB77J	Axial 680uF 16V	30p■
FB78K	Axial 680uF 25V	38p
FB79L	Axial 680uF 40V	68p
FB80B	Axial 1000uF 6.3V	29p
FB81C	Axial 1000uF 10V	25p
FB82D	Axial 1000uF 16V	32p
FB83E	Axial 1000uF 25V	40p
FB84F	Axial 1000uF 63V	£1.00
FB85G	Axial 1500uF 6.3V	32p
FB86T	Axial 1500uF 10V	38p
FB87U	Axial 1500uF 16V	42p
FB89W	Axial 2200uF 10V	40p
FB90X	Axial 2200uF 25V	57p
FB91Y	Axial 2200uF 40V	98p
FB92A	Axial 2200uF 63V	£1.54
FB93B	Axial 3300uF 6.3V	58p
FB94C	Axial 3300uF 25V	94p
FB95D	Axial 4700uF 10V	60p■
FB96E	Axial 4700uF 25V	£1.25

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1981 Catalogue Page No.		VAT inclusive PRICE
FB97F	Reversolytic 1uF	29p
FB00A	Reversolytic 1.5uF	32p
FB01B	Reversolytic 2.2uF	36p
FB02C	Reversolytic 3.3uF	42p
FB03D	Reversolytic 4.7uF	46p
FB04E	Reversolytic 6.8uF	54p
FB06G	Reversolytic 10uF	58p
FB07H	Reversolytic 15uF	66p■
FB08J	Reversolytic 22uF	68p
FB09K	Reversolytic 33uF	70p
FF19V	Can 1000uF 100V	£1.86
FF20W	Can 1500uf 63V	£1.95
FF21X	Can 2200uF 40V	£1.86
FF22Y	Can 2200uF 63V	£3.25
FF24B	Can 3300uF 40V	£2.15
FF25C	Can 3300uF 63V	£3.55
FF26D	Can 4700uF 25V	£1.45■
FF27E	Can 4700uF 40V	£4.35
FF28F	Can 4700uF 63V	£3.85
FF29G	Can 4700uF 100V	£5.35
FF30H	Can 6800uf 40V	£4.55
FF31J	Can 10,000uF 25V	£4.95
FF32K	Can 10,000uF 63V	£5.45■
FF33L	Clip Can 25	15p
FF34M	Clip Can 35	19p
FF35Q	Clip Can 40	19p
FF36P	Clip Can 50	45p
FF37S	Horiz Clip 25	18p
FF38R	Horiz Clip 35	18p
WL68Y	Trimmer 5.5pF	30p
WL69A	Trimmer 10pF	30p
WL70M	Trimmer 22pF	26p
WL72P	Trimmer 65pF	29p
WL71N	Trimmer 40pF	19p
WL73Q	Trimmer 500pF	35p
YQ24B	AM Varitune	£1.32

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1981 Catalogue Page No.		VAT inclusive PRICE
FF39N	Vari O	£4.45
FF40T	DG Vari	£6.35
FF41U	Twin OO	£5.60
FF42V	SW Trim 10pF	£4.45
FF43W	SW Trim 15pF	£4.45
FF44X	SW Trim 25pF	£4.80
FF45Y	SW Trim 50pF	£4.45
FF46A	SW Trim 60pF	£5.35
FF47B	SW Trim 75pF	£4.45
FF48C	SW Trim 100pF	£5.35
FF49D	SW Trim 150pF	£4.97
FF50E	Dilecon 300pF	£4.45
FF51F	Dilecon 500pF	£4.35
FY77J	FS Crystal 100kHz	£4.55
HX62S	FS Crystal 1MHz	£5.95
FY78K	FS Crystal 10MHz	£2.95
FY79L	MP Crystal 1MHz	£4.45
FY80B	MP Crystal 2MHz	£3.55
FY81C	MP Crystal 2.4576MHz	£3.35■
FY82D	MP Crystal 4MHz	£1.80■
FY83E	MP Crystal 6.144MHz	£2.45
FY84F	MP Crystal 18.432MHz	£2.65
HX30H	MCR Crys Brown Pairs	£2.96
HX31J	MCR Crystal Red Pair	£2.96
HX32K	MCR Crys Orange Pair	£2.96
HX33L	MCR Crys Yellow Pair	£2.96
HX34M	MCR Crystal Green Pr	£2.96
HX35Q	MCR Crys Blue Pair	£2.96
FY85G	Colour TV Crystal	£1.20

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1981 Catalogue Page No.		VAT inclusive PRICE
FY86T	Crystal 50HzX 2.16	£3.15
FY87U	Crystal 1HzX 2.22	£3.15
HX60Q	Crystal Socket 25u	23p
HX61R	Crystal Socket 6u	45p
HX99H	Ceramic Fltr 10.7MHz	60p

CAR EQUIPMENT

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1981 Catalogue Page No.		VAT inclusive PRICE
HW18U	Car Aerial Pull Up	£1.99
YB67X	Car Aerial Roof Top	£5.75
LH99H	Windscreen Aerial	£2.69
XX37S	Car Aerial Booster	£6.70
RW29G	Plugpak R	£1.95
RW30H	Plugpak S	£2.35
HW11M	Cigar Lighter	£2.65
YX75S	Accessory Socket	£1.55
HW12N	Car Accessory Plug	45p
YB68Y	Car Lighter Ext Lead	£2.25
YW59P	Car Power Lead	£2.70
FQ73Q	Map Light	64p

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1981 Catalogue Page No.		VAT inclusive PRICE
HW22Y	12V Inspection Lamp	£1.60
FQ76H	Inspection Lamp L86	£2.60
WY10L	Front Fog Lamp	£11.55
LY07H	Fog Lamp	£5.65
LQ13P	Wiper Kit	£21.75■
LY08J	Reversing Lamp	£4.55
LQ14Q	Washer Kit	£11.95■
WY09K	Demister	£7.35■
HQ30H	Wiper Control	£9.65■
FQ78K	Car Ammeter	£4.45

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1981 Catalogue Page No.		VAT inclusive PRICE
HQ35Q	Charger Ammeter	£1.35
HW16S	Car Flash 4-Lamp	£1.63
HW17T	Car Flash 6-Lamp	£1.55
FQ79L	Caravan Flasher	£6.30
FQ92A	7-Pin Trailer Plug	£2.35
FQ93B	7-Pin Trailer Socket	£2.98
XR55K	7-Core Trailer Cable	£1.15
FQ94C	Trailer Socket Bolts	33p
YB70M	Trailer Lamp Cluster	£4.97
YB71N	Trailer Reflector	£1.45
FQ95D	Sign 50mph	29p
FQ96E	Sign GB	29p
FQ88V	Plug-Top Supp Strt	42p
FQ89W	Plug-Top Supp Ang	50p
FQ90X	In-Line Plug Supp	25p

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1981 Catalogue Page No.		VAT inclusive PRICE
HW01B	Supp Cap Small Lucar	59p
*HW02C	Supp Cap Large Lucar	69p
HW03D	Supp Cap Spade	59p
FQ87U	Supp Cap 3uF	£1.12
FQ91Y	Suppressor Choke	84p
FQ77J	Jumper Leads	£4.40
YL02C	Magnilamp	95p
FQ97F	Anti-Glare Strip	95p
FQ98G	Luggage Elastic	45p
FQ99H	Ice Scraper	28p
YB72P	Tow Rope	£4.25
FY00A	Keep Clean Kit	DIS
YB94C	Plug Spanner	£1.75
FY01B	Tyre Pressure Gauge	£1.55
*XY74R	Electric Pump	£18.79

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1981 Catalogue Page No.		VAT inclusive PRICE
XB44X	Car Speakers Shelf	£6.75
XB42V	Car Speakers Door	£5.85
XY73Q	10W Shelf Spkrs	£18.25
XQ75S	10W Car Stereo Spkrs	£14.70
XQ76H	20W Air Suspen Spkrs	£19.49
LY06G	Car Cassette Carrier	£4.65
AF00A	Booster Amp	£18.70
AF01B	Booster Equaliser	£37.50

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1981 Catalogue Page No.		VAT inclusive PRICE
YX86T	Flow Sensor	£14.93
YX85G	Speed Sensor	£11.93

CONNECTORS

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1981 Catalogue Page No.		VAT inclusive PRICE
HF25C	Croc Clips	12p■
HF23A	Alligator Clip Black	11p
HF24B	Alligator Clip Red	11p
HF26D	Charger Clip	25p
BW69A	Croc Lead Kit	£1.45
HF10L	Push-On Receptacle	33p
HF11M	Push-On Blade	33p
HF12N	Push-On Covers	73p
YX47B	Comcon Block 5-way	36p
YX48C	Comcon Terminal	5p
HF02C	Terminal Post Black	35p
HF03D	Terminal Post Blue	37p
HF04E	Terminal Post Brown	37p
HF05F	Terminal Post Green	38p
HF06G	Terminal Post Grey	38p
HF07H	Terminal Post Red	35p
HF08J	Terminal Post White	38p
HF09K	Terminal Post Yellow	38p
HF13P	Press Terminal Black	28p
HF14Q	Press Terminal Blue	28p
HF15R	Press Terminal Green	28p
HF16S	Press Terminal Red	28p
HF17T	Press Terminal White	30p
HF18U	Press Terminal Yellw	28p
BW72P	Quickterm Lever 2way	49p■
YR92A	Quickterm Type B	62p
BW71N	Quckterm Push 4 way	62p■

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1981 Catalogue Page No.		VAT inclusive PRICE
WL57M	1mm Plug Black	20p
WL58N	1mm Plug Red	20p
WL59P	1mm Socket Black	15p
WL60Q	1mm Socket Red	15p
HF38R	2mm Plug Black	17p
HF39N	2mm Plug Blue	18p
HF40T	2mm Plug Green	17p
HF41U	2mm Plug Red	17p
HF42V	2mm Plug White	17p
HF43W	2mm Plug Yellow	18p
HF44X	2mm Socket Black	15p
HF45Y	2mm Socket Blue	15p
HF46A	2mm Socket Green	15p
HF47B	2mm Socket Red	15p
HF48C	2mm Socket White	15p
HF49D	2mm Socket Yellow	15p
HF50E	Wander Plug Black	17p
HF51F	Wander Plug Blue	17p
HF52G	Wander Plug Green	17p
HF53H	Wander Plug Red	17p
HF54J	Wander Plug White	17p
HF55K	Wander Plug Yellow	14p
HF56L	Wander Socket Black	14p
HF57M	Wander Socket Blue	14p
HF58N	Wander Socket Green	14p
HF59P	Wander Socket Red	14p■
HF60Q	Wander Socket White	14p
HF61R	Wander Socket Yellow	14p
HF62S	4mm Plug Black	15p
HF63T	4mm Plug Blue	15p
HF64U	4mm Plug Brown	15p
HF65V	4mm Plug Green	15p
HF66W	4mm Plug Red	15p
HF67X	4mm Plug White	15p
HF68Y	4mm Plug Yellow	15p
HF69A	4mm Socket Black	15p
HF70M	4mm Socket Blue	15p
HF71N	4mm Socket Brown	15p
HF72P	4mm Socket Green	15p
HF73Q	4mm Socket Red	15p
HF74R	4mm Socket White	17p
HF75S	4mm Socket Yellow	19p
HF34M	4mm Patch Cord	£1.98
HQ54J	Screw-Cap Phono Blk	12p
HQ55K	Screw Cap Phono Blue	12p
HQ58N	Screw Cap Phono Red	12p
HQ59P	Screw Cap Phono Whte	12p
HQ60Q	Screw Cap Phono Yell	12p
HH01B	Scr Phono	14p
YW06G	Threaded Phono Skt	15p
HH02C	Phono Socket Single	12p
HH03D	Phono Socket Twin	16p
BW74R	Phono Socket Quad	35p
BW75S	Phono Socket 5-way	45p
BW76H	Phono Socket 6-way	55p

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1981 Catalogue Page No.		VAT inclusive PRICE
HH04E	Line Phono	20p
HH05F	Phono Conn	19p
HF76H	2.5 Plug Plas	13p
HF77J	2.5 Plug Scr	22p
HF78K	2.5 Jack Socket	12p
HF79L	2.5 Line Socket	30p
HF80B	Plug Plas 3.5	12p
HF81C	Plug Scr 3.5	22p
HF82D	Jack Socket 3.5	14p
HF83E	Line Socket Plas 3.5	15p
HF84F	Line Socket Scr 3.5	21p
HF85G	Jack Plug Plas	21p
HF86T	Side Jack Plas	25p■
HF87U	Jack Plug Scr	37p
YW07H	SR Jack Plug	43p
YL03D	Side Jack Screened	29p
HF88V	Jack Pl Sto Plas	29p
HF89W	Jack Pl Sto Scr	45p
HF90X	Jack Skt Brk	21p
BW78K	Chro Mono Jack Skt	39p
HF91Y	Jack Skt Open	19p
HF92A	Jack Skt Sto	24p

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1981 Catalogue Page No.		VAT inclusive PRICE
BW79L	Chro Stereo Jack Skt	35p
HF93B	Stereo Open Skt	35p
BW80B	DPDT Jack Socket	48p
HH19V	Line Jack Plas	24p
HH20W	Scr Line Jack	38p
HH21X	Stereo Line Skt	30p
HH22Y	Scr Stereo Line Skt	58p
HH07H	Co-ax Plug Aly	24p
HH06G	Co-ax Plug Plas	15p
YW08J	Co-ax Plug Imp	15p
HH08J	Co-ax Socket Pan	37p
HH09K	Co-ax Socket Flush	29p
YW09K	Co-ax Line Skt	43p
HH11M	Co-ax Conn	12p
HH13R	Skeleton Car Plug	14p
HH12N	Car Plug Plas	49p
HH14Q	Chassis Car Socket	24p
HH15R	Car Line Socket	DIS
HH16S	FM Aerial Plug	17p
HH17T	BNC Plug	98p
HH18U	BNC Socket	98p

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YW00A	BNC Square Socket	85p
YW01B	BNC Line Socket	£1.10
YW02C	BNC Straight Adaptor	£1.37
YW03D	BNC T Adaptor	£2.95
BW81C	Plug PL259	51p
BW82D	UHF Reducer Small	17p
BW83E	UHF Reducer Large	17p
BW84F	UHF Socket Round	49p
BW85G	Socket SO239	53p
BW86T	UHF Elbow Adaptor	£1.32
BW87U	UHF Straight Adaptor	59p
BW88V	UHF T Adaptor	£1.55
YW04E	Adaptor 239	£1.12
YW05F	Adaptor 259	£1.40
YX51F	Audio Conn 2-way	£1.15
YX52G	Audio Conn 3-way	£1.35
YX53H	Audio Conn 4-way	£1.26
YX54J	Audio Conn 5-way	£1.55
YX55K	Audio Conn 6-way	£1.75
BW89W	XLR Line Plug	£1.82

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1981 Catalogue Page No.		VAT inclusive PRICE
BW90X	XLR Chassis Socket	£2.62
BW91Y	XLR Line Socket	£2.15
BW92A	XLR Chassis Plug	£1.45
BW94C	Dinlatch 5-pin A Plg	£1.30
BW98G	Dinltch Sckt 5-pin A	69p
HH24B	DIN L/S Plug	10p■
HH25C	DIN Plug 3-pin	16p
HH26D	DIN Plug 4-pin	30p
HH27E	DIN Plug 5-pin A	15p
HH28F	DIN Plug 5-pin B	19p
HH29G	DIN Plug 6-pin	39p
HH30H	DIN Plug 7-pin	19p
HH31J	DIN L/S Socket	7p
HH32K	DIN Socket 3-pin	16p
HH33L	DIN Socket 4-pin	16p
HH34M	DIN Socket 5-pin A	14p
HH35Q	DIN Socket 5-pin B	18p
HH36P	DIN Socket 6-pin	21p
HH37S	DIN Socket 7-pin	19p■
HH40T	DIN Line Skt 2-pin	15p
HH41U	DIN Line Scket 3-pin	16p
HH42V	DIN Line Scket 4-pin	DIS
HH43W	DIN Line Skt 5-pin A	16p
HH44X	DIN Line Skt 5-pin B	21p
HH45Y	DIN Line Scket 6-pin	20p■
HH46A	DIN Line Scket 7-pin	DIS
YX90X	PC DIN Skt 2-pin	25p
YX91Y	PC DIN Skt 5-pin A	25p

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YQ48C	D-Range 25-Way Plug	£2.15■
YQ49D	D-Range 25W Socket	£2.35■
YQ50E	D-Range 25-Way Cover	£2.25
YQ51F	D-Range Latch	33p
WQ14Q	PCB Connectors 45	7p■
WQ15R	PCB Connectors Vert	7p■
WQ16S	PCB Connectors Horz	7p
FL83E	Edge Connector 108	40p
FL84F	Edge Connector 116	76p
FL85G	Edge Connector 124	92p
FL86T	Edge Connector 132	£1.95
FL87U	Edge Connector 140	£1.86
FL91Y	Edge Connector FeetG	15p
FL92A	Edge Connector FeetH	14p
FL93B	Edge Connector FeetL	DIS
FL30H	Edge Connector Silvr	£1.99
YR57M	Card Frame Edge Conn	£3.95
YR58N	Edge Conn End Bkt	23p

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1981 Catalogue Page No.		VAT inclusive PRICE
HL01B	Octal Ch Plug	75p
HL00A	Octal Ch Skt	50p
HL02C	8-way Plug	85p
HL03D	8-way Socket	90p
HF35Q	Voltage Selector Skt	DIS
†HF37S	Voltage Selector Plg	95p
YX33L	Multicon Plug 2-way	15p
YX34M	Multicon Plug 4-way	19p
YX35Q	Multicon Plug 9-way	29p
YX36P	Multicon Plug 15-way	43p
YX37S	Multicon Plug 24-way	58p
YX38R	Multicon Plug 36-way	78p
YX39N	Multicon Skt 2-way	18p
YX40T	Multicon Skt 4-way	19p
YX41U	Multicon Skt 9-way	27p
YX42V	Multicon Skt 15-way	45p
YX43W	Multicon Skt 24-way	59p
YX44X	Multicon Skt 36-way	68p
YX45Y	Multicon Plug Pin	3p
YX46A	Multicon Skt Pin	3p

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1981 Catalogue Page No.		VAT inclusive PRICE
YW10L	Minicon Plug 3-pin	20p
YW11M	Minicon Plug 4-pin	22p
YW12N	Minicon Plug 6-pin	29p
YW13P	Minicon Plug 8-pin	39p
YW14Q	Minicon Plug 12-pin	48p
YW15R	RA Minicon Pl 3-pin	31p
YW16S	RA Minicon Pl 4-pin	38p
YW17T	RA Minicon Pl 6-pin	47p
YW18U	RA Minicon Pl 8-pin	52p
YW19V	RA Minicon Pl 12-pin	74p
YW20W	Minicon Hsg 3-pin	10p
YW21X	Minicon Hsg 4-pin	10p
YW22Y	Minicon Hsg 6-pin	12p
YW23A	Minicon Hsg 8-pin	15p
YW24B	Minicon Hsg 12-pin	17p
YW25C	Minicon Terminal	3p
YW26D	Minicon Skt 3-way	24p
YW27E	Minicon Skt 4-way	30p
YW28F	Minicon Skt 6-way	36p
YW29G	Minicon Skt 8-way	50p
YW30H	Minicon Skt 12-way	59p■
YW31J	Polarcon 0.1in	6p■

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YW95D	IDC Con 3-way	20p
YW96E	IDC Con 4-way	26p
YW97F	IDC Con 6-way	38p
YW98G	IDC Con 8-way	50p
YW99H	IDC Con 12-way	88p
YX49D	IDC Insertion Tool	£1.85
HL04E	Wafercon Plug 3-pin	12p
HL05F	Wafercon Plug 4-pin	14p
HL06G	Wafercon Plug 6-pin	19p
HL07H	Wafercon Plug 8-pin	19p
HL08J	Wafercon Plug 12-pin	29p

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HL09K	Wafercon Skt 3-way	11p
HL10L	Wafercon Skt 4-way	10p
HL11M	Wafercon Skt 6-way	16p
HL12N	Wafercon Skt 8-way	17p
HL13P	Wafercon Skt 12-way	25p
HL14Q	Wafercon Terminal	2½p
YW32K	Polarcon 0.2in	6p■
YW40T	Compactboard	£13.50
YY22Y	CB Pin Blue	37p
YY23A	CB Pin Red	37p
YY26D	CT Pin White	£1.26
YY27E	AT Pin Black	£1.33
YR63T	CB Plug Extractor	£7.50
YB08J	Large Patchboard	£111.00
WQ10L	Large Patch Plug	37p
HH39N	Multi-position Plug	67p
HH38R	Universal Plug	85p

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HH60Q	Std Power Plug 2.1	14p
HH61R	Long Pwr Plug 2.1	16p
HH62S	Std Power Plug 2.5	15p
HH63T	Long Pwr Plug 2.5	14p
HH85G	Power Skt 2.1	20p
HH86T	Power Skt 2.5	22p
HH87U	Cassette Skt Nivico	39p
HH88V	Cassette Skt Paros	46p
HL17T	USA Mains Plug	20p
HL18U	Flat Pin M/S	27p
HL19V	Flat Pin Conn	31p
RW56L	Cas Lead Crown	60p
RW57M	Cas Lead Hitachi	60p
RW58N	Cas Lead Nat Pan	60p
RW59P	Cas Lead Nivico	60p
RW60Q	Cas Lead Otake-Orion	60p
RW61R	Cas Lead Paros	65p
RW62S	Cas Lead Philips	75p
RW63T	Cas Lead Sanyo	60p
RW64U	Cas Lead Sharp	60p

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RW65V	Cas Lead Sony	60p
RW66W	Cas Lead Telefunken	65p■
YX62S	Cassette Lead OS219	60p
YX63T	Cassette Lead 955	60p
HL16S	Eurosocket	75p■
HL15R	Europlug	48p
HL42V	Euro Facility Outlet	£1.55
HL43W	Euro Facility Plug	75p■
BW99H	Euroconn Lead	£1.75
WY16S	Euroboard 4-way	£7.35■
WY17T	Euroboard 6-way	£10.75
HL20W	Mains Plug P429	64p
HL44X	Mains Socket P646	£1.39
HL23A	Mains Socket P430SE	£1.15
HL45Y	Mains Plug P649	£1.15
HL46A	Mains Socket P650	98p
HL47B	Mains Plug SA2403	£1.36
HL48C	Mains Socket SA2404	79p
HL27E	Mains Plug SA2190	49p

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HL28F	Mains Socket SA1862	52p
HL49D	Mains Socket SA2111	£1.75
HL30H	Mains Plug SA2019A	£1.48
HL31J	Mains Socket SA2020	£1.34
HL33L	Mains Plug SA2367	£1.55
HL34M	Mains Socket SA2368	93p
HL36P	Mains Plug P635	£1.05
HL37S	Mains Socket P636	£1.22
HL39N	Mains Plug P551	£2.97
HL40T	Mains Socket P552	98p
HL50E	Sleeve 8037	12p
HL51F	Boot 9455	27p
HL52G	Boot 8878	38p

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RW04E	Adaptor E	45p
RW01B	Adaptor B	40p
YW38R	Adaptor W	59p
YW39N	Adaptor X	56p
RW07H	Adaptor H	38p
RW03D	Adaptor D	40p
RW11M	Adaptor M	39p
RW06G	Adaptor G	46p
RW08J	Adaptor J	37p
RW00A	Adaptor A	42p
YW34M	Adaptor S	55p
YW35Q	Adaptor T	£1.25■
RW05F	Adaptor F	40p
RW09K	Adaptor K	40p
RW02C	Adaptor C	45p
YW37S	Adaptor V	£1.55■
RW12N	Adaptor N	39p
YW33L	Adaptor R	£1.28
HL53H	Adaptor P	£1.30
YW36P	Adaptor U	99p
RW27E	Dinpak P	60p
RW26D	Dinpak N	£1.20
RW45Y	Dinpak 273	£1.25
RW44X	Dinpak 262	75p
RW47B	Dinpak 275	95p
RW25C	Dinpak M	£1.55■
RW46A	Dinpak 274	£1.50
RW15R	Dinpak B	£1.55
RW14Q	Dinpak A	£1.10
RW43W	Dinpak 254	£1.10
RW16S	Dinpak C	£1.10■
RW22Y	Dinpak J	69p

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RW23A	Dinpak K	65p
RW24B	Dinpak L	81p
RW18U	Dinpak E	82p
RW19V	Dinpak F	95p
RW17T	Dinpak D	£1.42
RW20W	Dinpak G	£1.34
RW49D	Dinpak 280	£1.55

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RW37S	Dinpak 205	DIS
RW48C	Plugpak 279	98p
RW50E	Plugpak 282	89p
RW51F	Plugpak 283	£1.85
RW28F	Plugpak Q	65p
RW31J	Plugpak T	£2.25
RW32K	Plugpak V	£1.35
RW34M	Plugpak X	£2.48
RW35Q	Plugpak HD Guitar	£4.45

CONSUMER

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AF18U	Canon LC31	£6.95
AF19V	Canon LC52	£11.85
AF20W	Canon FC42	£13.95

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AF21X	Canon LC61T	£16.95
AF22Y	Canon P7-D	DIS
YX88V	P7 Paper Roll	46p
YX89W	P7 Ink Cassette	£2.75

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AF02C	Atari 800 Computer	£645.00

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AF03D	Atari 400 8K Computr	DIS
AF28F	Recorder 410	£50.00
AF04E	Printer 822	£265.00

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AF06G	Disc Drive 810	£345.00
YX87U	Mini Floppy Disc	£2.75
AF29G	Interface 850	£135.00
AF07H	8K Memory Module	NYA
AF08J	16K Memory Module	£64.00
AF05F	Printer 825	NYA
AF30H	Modem 830	NYA
AC38R	See YG48C	See
AC39N	See YG63T	note
AC40T	See YG66W	below

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WF20W	Mag Headset	£4.85
LH81C	Education Headphone	£5.75
LH82D	Boom Mic Headphone	£12.35
LH83E	Stereophone OH150P	£4.25
WF13P	Stereophone HP110C	£5.40
WF14Q	Stereophone DH207	£7.99
LH84F	Stereophone M110B	£8.60
*LH85G	Stereophone HS310	£12.50

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WF19V	Sterephone Elec 100	DIS
LB13P	Headphone Adaptor	£3.95
LB72P	Intercom 2-Station	£8.75
XY78K	FM Intercom Pair	DIS
XY77J	4-Channel FM Intrcom	£29.95■

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WY11M	Compact PA Amp	£21.50
WY12N	10W PA Amp	£29.95
XY81C	40W PA Amp	£65.50
XY82D	60W PA Amp	£106.75

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AF09K	AM Radio	£1.95
AF10L	AM/FM Radio	£4.95
AF11M	AM/FM/Air Radio	£12.95
AF17T	5-Band Radio	£37.50
AF12N	Teak Clock Radio	£22.50
AF13P	Silver Clock Radio	£22.50

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AF14Q	Cassette Clock Radio	£45.90
AF15R	3-Band Radio Recordr	£35.60
AF16S	4-Band Recorder	£44.50
AF27E	GE1305 Equaliser	£77.50

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AC00A	Vid Gme Cnsl	£99.95
AC01B	Air Sea Battle Game	£18.95
AC02C	Space War Game	£18.95

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AC03D	Outlaw Game	£18.95
AC04E	Video Olympics Game	£18.95
AC05F	Breakout Game	£18.95
AC06G	Basketball Game	£18.95
AC07H	Surround Game	£18.95

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AC09K	Fun Wth Numbers Game	£18.95
AC10L	Codebreaker Game	£18.95
AC11M	Hunt & Score Game	£18.95
AC12N	Miniature Golf Game	£16.95
AC13P	Skydiver Game	£18.95
AC14Q	Street Racer Game	£18.95
AC15R	Bowling Game	£18.95

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AC16S	Brain Games	£18.95
AC18U	Golf Game	£18.95
AC19V	Slot Racers Game	£18.95
AC21X	Superman Game	£29.95
AC22Y	Adventure Game	£29.95
AC24B	Indy 500 Game	£34.50
AC25C	Backgammon Game	£24.95■

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AC26D	Space Invaders Game	£29.95
AC27E	Programming Cartrdg	£24.95■
AC28F	Chess Game	£24.95■

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AC20W	Circus Game	£24.95
AC17T	Human Cannonball	£18.95
AC23A	Casino Game	£29.95
AC31J	Night Driver Game	£24.95
AC32K	Dodge Em	£18.95
AC33L	Pele Soccer Game	£29.95
AC34M	Hangman Game	£18.95
AC35Q	Video Checkers	£18.95■

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AC36P	Maze Craze	£24.95
AC29G	Video Game Keyboard	£13.95
AC30H	Video Game Paddles	£13.95
AC37S	Video Game Joysticks	£13.95

ELECTRICAL

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HF01B	Terminal Block 5A	33p
HL54J	Terminal Block 15A	69p
HL55K	Terminal Block 30A	£1.10
HL56L	Terminal Block Conn	£1.47
*HL57M	5 Amp Plug	59p
RW67X	13 Amp Plug Nylon	79p
HL58N	Rubber 13A Plug	99p
HL59P	15A Plug Nylon	99p
HL60Q	Kettle Connector	£1.67
HL61R	Flex Connector	£1.40
HL62S	Mains Adaptor 2-way	£2.20
HL63T	Mains Adaptor 3-way	£2.95
HL64U	Shaver Adaptor	£1.15

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HL65V	Junction Box Small	£1.50
HL66W	Junction Box Lge	99p
HL67X	Junction Box RM	£1.75■
HL68Y	Single Skt Unswtched	£1.85
HL69A	Dble Skt Unswitched	£3.75
HL70M	Dble Skt Unswchd Slv	£7.30
HL71N	Single Sw Socket	£2.60
HL72P	Double Sw Socket	£5.20
HL73Q	Trailing Skt Single	£1.75
HL74R	Trailing Dble Skt	£3.45
RW68Y	Dis Board 4-way	£8.75
HL76H	Cooker Switch	£7.30
HL77J	Neon Cooker Switch	£9.98
HL78K	Shaver Skt Isolated	£18.75

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HL79L	Shaver Socket	67p
HL80B	Cooker Outlet C	£2.10
HL81C	Cooker Outlet T	£3.20
HL82D	Flex Outlet Unswchd	£3.75
HL83E	Switched Flex Outlet	£4.25
HL84F	Clock Connector S	DIS
HL85G	Clock Connector B	£4.75
HL86T	Blanking Plate	85p
HL87U	20A Plateswitch	£3.20
HL88V	20A Water Htr Switch	£4.85
HL89W	Light Swch ST Single	£1.08
HL90X	Light Swch DT Single	£1.49
HL91Y	Light Swch Dual	£2.25
HL92A	Light Switch Triple	£2.95
HL93B	Light Switch Quad	DIS

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FQ10L	250W Rotary Dimmer	£7.30
FQ12N	250W Push Dmr Sngl	£9.95
FQ13P	250W Push Dmr Dble	£19.49
*FQ14Q	250W Touch Dimmer	£15.95
XX35Q	Remote Control Dmmr	£29.45
XX36P	Dmmr Control Box	£15.75
FQ15R	Security Dimmer	£14.95
FQ16S	Auto Security Switch	£13.25
YB09K	Fl Pattress 16mm Sgl	70p
YB10L	Fl Pattress 25mm Sgl	70p
YB11M	Fl Pattress 25mm Dbl	£1.06
YB12N	Fl Pattress 35mm Dbl	£1.25
YB13P	Steel Pattress 47mm	£2.55
YB14Q	Sur Patt 20mm Sngl	78p
YB15R	Sur Patt 29mm Sngl	92p
YB16S	Sur Patt 29mm Dble	£1.65
YB17T	Sur Patt 47mm Dble	£2.75
YB18U	Conversion Pattress	£2.50

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FQ00A	Ceiling Switch 1-way	£2.65
FQ01B	Ceiling Switch 2-way	DIS
FQ02C	Lampholder 702	75p
FQ03D	Lampholder 254 CG	DIS
FQ04E	Lampholder 252 1/2in	65p
LB63T	Bayonet L/Hldr	88p
FQ05F	Ceiling Rose	£1.08
FQ06G	BC Adaptor	DIS
FQ07H	Starter 80W	25p
YB19V	Time Switch	£16.95
RW69A	Power Controller	£20.95
YB20W	Room Thermostat	£8.25
XY08J	Extn Lead 5A	£13.80
XY09K	Extn Lead 13A	£17.95

HARDWARE

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BF00A	Bolt 2BA 1/2in	33p
BF01B	Bolt 2BA 1in	85p
BF02C	Bolt 4BA 1/4in	25p
BF03D	Bolt 4BA 1/2in	28p
BF04E	Bolt 4BA 1in	30p
LR52G	Bolt 4BA 1.1/2in	33p
BF05F	Bolt 6BA 1/4in	12p
BF06G	Bolt 6BA 1/2in	14p
BF07H	Bolt 6BA 1in	38p
LR53H	Bolt 6BA 1.1/2in	63p
BF08J	Bolt 8BA 1/4in	28p
BF09K	Bolt 8BA 1/2in	24p■
LR54J	C/S Screw 2BA 1/2in	14p
LR55K	C/S Screw 4BA 1/4in	14p
BF10L	C/S Screw 4BA 1/2in	17p
BF11M	C/S Screw 4BA 1in	32p
LR56L	C/S Screw 6BA 1/4in	9p
BF12N	C/S Screw 6BA 1/2in	19p
BF13P	C/S Screw 6BA 1in	35p
LR00A	C/S Screw 8BA 1/2in	29p
BF14Q	Panel Screw	3p
LR75S	C/S Panel Screw	5p
BF16S	Nut 2BA	19p■
BF17T	Nut 4BA	19p
BF18U	Nut 6BA	12p■
BF19V	Nut 8BA	12p■
BF20W	Washer 2BA	12p■
BF21X	Washer 4BA	9p
BF22Y	Washer 6BA	9p
BF23A	Washer 8BA	9p
LR76H	Cup Washer	2p
BF24B	Shake 2BA	9p■
BF25C	Shake 4BA	9p
BF26D	Shake 6BA	9p
LR01B	Shake 8BA	8p
BF27E	Tag 2BA	12p
BF28F	Tag 4BA	9p
BF29G	Tag 6BA	13p
LR02C	Tag 8BA	11p
BF30H	Pozi Screw M5 6mm	23p
BF31J	Pozi Screw M5 12mm	33p

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BF32K	Pozi Screw M5 25mm	33p
BF33L	Pozi Screw M4 6mm	25p
BF34M	Pozi Screw M4 12mm	32p
BF35Q	Pozi Screw M4 25mm	27p
BF36P	Pozi Screw M3 6mm	13p
LR57M	Pozi Screw M3 9mm	13p
BF37S	Pozi Screw M3 12mm	15p
BF38R	Pozi Screw M3 25mm	27p
LR58N	Pozi Screw M3 40mm	33p
BF39N	Pozi Screw M2.5 6mm	15p
BF40T	Pozi Screw M2.5 12mm	18p
BF41U	Pozi Screw M2 6mm	29p■
BF46A	Isobolt M5 12mm	55p
BF48C	Isobolt M4 6mm	26p
BF49D	Isobolt M4 12mm	33p
BF50E	Isobolt M4 25mm	57p
BF51F	Isobolt M3 6mm	20p
BF52G	Isobolt M3 12mm	26p
BF53H	Isobolt M3 25mm	35p
BF54J	Isobolt M2.5 6mm	19p
BF55K	Isobolt M2.5 12mm	24p
BF56L	Isonut M5	20p■
BF57M	Isonut M4	20p
BF58N	Isonut M3	15p
BF59P	Isonut M2.5	14p
LR59P	Isonut M2	10p
BF60Q	Isowasher M5	15p
BF61R	Isowasher M4	9p
BF62S	Isowasher M3	9p
BF63T	Isowasher M2.5	9p
LR60Q	Isowasher M2	7p
BF42V	Isoshake M5	12p
BF43W	Isoshake M4	9p
BF44X	Isoshake M3	9p
BF45Y	Isoshake M2.5	9p
LR61R	Isoshake M2	9p

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LR62S	Isotag M5	18p
LR63T	Isotag M4	20p
LR64U	Isotag M3	12p
LR65V	Isotag M2.5	12p
LR66W	Isotag M2	8½p
BF68Y	Slf-Tpr No.8 x 3/8in	22p
BF69A	Slf-Tpr No.8 x 1/2in	25p
LR67X	Slf-Tpr No.6 x 3/8in	20p
BF67X	Slf-Tpr No.6 x 1/2in	22p
BF65V	Slf-Tpr No.4 x 3/8in	15p
BF66W	Slf-Tpr No.4 x 1/2in	16p
BF64U	Slf-Tpr No.2 x 3/16"	12p
LR68Y	Slf-Tpr No.2 x 3/8in	14p
BF70M	Nyl 2BA 1/2in	86p
BF71N	Nyl 2BA 1in	95p
BF72P	Nyl 4BA 1/2in	39p
BF73Q	Nyl 4BA 1in	55p
BF74R	Nyl 4BA 1.1/2in	£1.55
BF75S	Nyl 6BA 1/2in	50p
BF76H	Nyl 6BA 1in	60p
BF77J	Nyl 8BA 1/2in	60p
BF78K	Nyl Nut 2BA	55p
BF79L	Nyl Nut 4BA	55p
BF80B	Nyl Nut 6BA	53p
BF81C	Nyl Nut 8BA	55p
BF82D	Nyl Washer 2BA	18p
BF83E	Nyl Washer 4BA	18p
BF84F	Nyl Washer 6BA	18p
BF85G	Nyl Washer 8BA	26p
WH18U	Nyl C/S Scw M3 x12mm	3½p
WH19V	Nylon Nut M3	3½p
BF15R	Spring Clip	4p
YW94C	Batten Clip	4p
LB99H	Blk Wdscrw No 4 1/2"	15p
BH44X	Plas Fixing	12p
YL23A	Hand Wheel Bolt	35p
FW10L	Spade 2BA	26p
FW11M	Spade 4BA	23p
FW13P	Studding 2BA	32p
FW14Q	Studding 4BA	30p
FW15R	Studding 6BA	30p
FW30H	4BA Spacer 1/8in	35p
FW31J	4BA Spacer 1/4in	48p
FW32K	4BA Spacer 1/2in	48p
FW33L	6BA Spacer 1/8in	32p
FW34M	6BA Spacer 1/4in	35p
FW35Q	6BA Spacer 1/2in	49p
LR69A	8BA Spacer 1/8in	28p
LR70M	8BA Spacer 1/4in	32p
LR71N	Thrded Spcr 4BA	78p
LR72P	Thrded Spcr 6BA	59p

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FW16S	Standoff Short	5p
FW17T	Standoff Medium	6p
FW18U	Standoff Long	7p
LR03D	Terry Clip 1/2in	10p
LR73Q	Terry Clip 1 1/2in	26p
FW59P	Grommet Small	2p
FW60Q	Grommet Large	2p
LR47B	SR Grommet 3P-4	6p■
LR48C	SR Grommet 5M-3	7p
LR49D	SR Grommet 6W-1	10p
LR50E	SR Grommet 7K-2	26p
LR51F	Sealing Grommet	8p
BL74R	Flexigrommet A	24p
BL75S	Flexigrommet B	29p
BL76H	Flexigrommet C	31p
FW36P	Hole Plug 1/4in	5p
FW37S	Hole Plug 3/8in	7p
HB22Y	Quickstick Pads	9p
HB21X	Velcromounts	12p
LQ12N	Sealing Strip	79p■

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LH12N	Aly Sheet 18 swg	£1.59
LH13P	Aly Sheet 16 swg	£3.85
LW21X	Mixer Trim 4	DIS
LW22Y	Mixer Trim 8	DIS
LW23A	Mixer Trim 12	DIS
LW24B	Mixer Trim 16	DIS
LW17T	Mixer Mtg Tube 4	£1.10
LW18U	Mixer Mtg Tube 8	£1.65
LW19V	Mixer Mtg Tube 12	DIS
LW20W	Mixer Mtg Tube 16	DIS
WH48C	Mains Warning Label	15p
XX31J	PCB Guides	25p
XH39N	Transfer 1/8in Black	£1.35
XH40T	Transfer 1/8in Red	£1.56
XH41U	Transfer 1/8in White	£1.56
XH42V	Transfer 1/4in Black	£1.56
XH43W	Transfer 1/4in Red	£1.35
XH44X	Transfer 1/4in White	£1.35
XH45Y	Panel Transfer Black	£1.56
XH46A	Panel Transfer Red	£1.56
XH47B	Panel Transfer White	£1.35

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KNOBS

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RW75S	Knob BK12	16p
RW77J	Knob PN20	DIS
RX99H	Knob RN92	25p
RW87U	Knob KB4	22p
RW86T	Knob KB3	45p
RX09K	Knob R78	58p
HB23A	Knob K1	29p
HB24B	Knob K2	37p
HB19V	Knob RK401	95p
HB57M	Knob RK403	£1.55
RW88V	Knob M1	38p
RW89W	Knob M2	30p
RW90X	Knob M3	26p
RX00A	Knob M4	45p
RX10L	Knob R81	45p
RX11M	Knob 82	55p

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RW78K	Knob F10	33p■
HB26D	Knob F11	31p
RX01B	Knob NK2	45p
RX02C	Knob PK2	45p
YX01B	Knob K7A	24p
YX02C	Knob K7B	27p
YX03D	Knob K7C	32p
YX04E	Knob K7D	49p
HB28F	Knob R51	52p
HB29G	Knob R52	53p
RX07H	Knob R76	55p
RX08J	Knob R77	64p
HB30H	Knob R53	69p
HB31J	Knob R54	96p
YR64U	Knob K8A	43p
YR65V	Knob K8B	56p
YR66W	Knob K8C	64p
HB34M	Knob K105L	95p
HB35Q	Knob K106L	£1.74
HB32K	Knob K105	59p
HB33L	Knob K106	95p
HB36P	Knob K15	55p
HB37S	Knob K24	75p
HB38R	Knob K30	72p
HB39N	Knob K44	69p
HB40T	Knob K45	79p
HB41U	Knob K46	£1.15

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RX16S	Collet Knob Black	38p
RX17T	Collet Knob Grey	43p
WL45Y	15mm Collet Cap Blk	5p
WL46A	15mm Collet Cap Blue	5p
WL47B	15mm Collet Cap Grn	5p
WL48C	15mm Collet Cap Grey	5p
WL49D	15mm Collet Cap Red	5p
WL50E	15mm Collet Cap Yllw	5p
WL51F	15mm Collet Pntr Blk	5p
WL52G	15mm Collet Pntr Blu	5p
WL53H	15mm Collet Pntr Grn	5p
WL54J	15mm Collet Pntr Gry	5p
WL55K	15mm Collet Pntr Red	5p
WL56L	15mm Collet Pntr Ylw	5p
RX18U	15mm Collet Nut Cvr	12p
RX19V	15mm Collet Indctr	16p
RX20W	15mm Collet Skirt	19p
RX21X	15mm Collet Stator	17p
*WL43W	Collet Rd Nut 3/8in	16p
*WL44X	Collet Rd Nut 10mm	16p
RX22Y	Slide Knob A	15p
YG09K	Slide Knob B	19p
YG10L	Slide Knob C Black	20p
YG11M	Slide Knob C Chrome	29p
RX24B	Slide Knob F Blk	17p
RX25C	Slide Knob F Blue	17p
RX26D	Slide Knob F Green	17p
RX27E	Slide Knob F Grey	17p
RX28F	Slide Knob F Red	17p
RX29G	Spindle Coupler	49p
RX30H	Ext Spindle	69p
*RX38R	Nylon Rod	14p
RX45Y	Cord Drive Brass	89p
RX46A	Cord Drive Steel	£1.39

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RX31J	Brass Bush	53p
BL73Q	Drive Cord	7p
RX43W	Cord Drum Small	£1.05
RX94C	Cord Drum Large	£1.05
RX44X	Flywheel	£2.75
RX39N	Vernier Dial Small	£2.05
RX40T	Vernier Dial Medium	£2.95
RX41U	Vernier Dial Large	MAY 82
RX42V	Ball Drive	£2.35
HB42V	Mini Ball Drive	£1.95
HB43W	DR Drive Scale	£9.75
HB45Y	Aluminium Dial	£4.75
HB46A	White Pointer	35p
HB47B	Ball Drive Pointer	55p
HB48C	Spring Short	9p■
HB49D	Spring Medium	9p■
HB50E	Spring Long	9p■
RX95D	Pulley 1/2in	14p

MICROPHONES

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LB92A	Phone Coil	85p
LB93B	Crystal Mic Insert	50p
LB68Y	Lapel Mic	£1.28
YW69A	Stick Mic	DIS
YB31J	Cassette Mic Jacks	£1.95
YB32K	Cassette Mic DIN	£2.75
YB33L	Electret Cssette Mic	£2.95
WF35Q	Dynamic Ball Mic	£9.93
LH86T	Long Stem Mic	DIS

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LH87U	Dynamic Stereo Mics	£10.25
WF05F	Communications Mic	£5.75
YW70M	Diff Comm Mic	£8.25
YW77J	Mic Hldr Screw-Fix	28p
YW78K	Mic Hldr Adhesive	49p
YW79L	Mic Hldr Magnetic	52p
XY72P	Base Station Mic	£24.75
LB69A	Tie Clip Mic	£7.85■

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YW71N	UM Tie Clip Mic	£12.45
YB34M	Low Cost Elect Mic	DIS
YB35Q	Eletret Mic 8CM31	£10.45
WF34M	Electret Mic Dual-2	£16.75

Note: For details of software, please ask for leaflet XH52G (Issue 2 now available).

1981 Catalogue Page No.		VAT inclusive PRICE
YB36P	Unisound Mic EMS2D	£19.17
YB37S	Unisound Mic EMS3D	£20.85

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WY06G	Super Cardioid Mic	£23.55
WY07H	Stereo Electret Mic	£19.75
YB38R	Unisnd Mic DM1500D	£35.45
LB94C	Screen S15	£6.58
LB95D	Mic Unit U15	£6.95
LB35Q	Mic Windshield	45p
YW72P	Gsneck Mic Stand 8in	£1.99
LH88V	Gsneck Mic Stnd 12in	£2.95
WF36P	Gsneck Mic Stnd 21in	£3.45■
YW73Q	Plastic Gsneck Base	65p
YW74R	Metal Gsneck Base	£3.25
WF37S	Bkt For Gsnk Stand	£1.95

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LB96E	Table-Top Mic Stand	£2.25■
YW75S	Cast Base Mic Stand	£3.85
YW76H	Extra Hgt Mic Stand	£6.95
XB45Y	5-Foot Mic Stand	£13.45
XB46A	Boom Arm	£12.65

MUSICAL

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LB97F	Pre-Amp EQ2S	£3.45
YB39N	Pre-Amp CS5	£8.43
XB30H	Mono Mic Mixer	£8.65
XB29G	Stereo Mixer	£22.88
LB66W	Mini-Phaser	£19.77
YB30H	Fuzz Box	£15.25

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XB41U	Fuzz Wah Pedal	£29.50
XB34M	Vibra Chorus	£57.30
YB88V	Mini Compressor	£21.20
XB33L	Echo Chamber	£67.33
LB67X	Echo Chamber Tape	£4.99
XY80B	BBD Echo Machine	£72.50

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YB40T	Cry Guitar Pick-Up	£3.93
YB41U	Nylon Mag Pick-Up	£7.30
YB42V	Steel Mag P.U	£8.45
YL08J	Pickup Transl AJ21	£27.95
YL09K	Pickup Transl AJ51	£19.95
YL10L	Pickup Transl AJ15	DIS
YL07H	Pickup Switch	£2.65
LB78K	Guitar Strings Nylon	£1.85
LB60Q	Guitar Strings Steel	£1.55
LB98G	Strap Button	49p

OPTO

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RX86T	MES Batten Hldr	21p
RX57M	Holder MES Amber	£1.45
RX58N	Holder MES Blue	DIS
RX59P	Holder MES Clear	£1.45
RX60Q	Holder MES Green	£1.45
RX61R	Holder MES Red	£1.45
RX76H	Dmd LES Lhldr Blue	TEMP
RX77J	Dmd LES Lhldr Green	35p
RX78K	Dmd LES Lhldr Red	35p
RX79L	Dmd LES Lhldr White	35p
RX80B	Dmd LES Lhldr Yellow	35p
RX67X	Flt Tp LES Lhldr Blu	35p
RX68Y	Flt-Tp LES Lhldr Grn	35p
RX69A	Flt-Tp LES Lhldr Red	35p
FF66W	Fluted Lhldr Amber	30p
FF67X	Fluted Lhldr Clear	30p
FF68Y	Fluted Lhldr Green	30p
FF69A	Fluted Lhldr Red	30p
YY00A	LES Cover Amber	6p
YY01B	LES Cover Blue	6p
YY02C	LES Cover Green	6p
YY03D	LES Cover Purple	6p
YY04E	LES Cover Red	6p
YY05F	LES Cover White	6p
YY06G	LES Cover Yellow	6p
RX82D	Pan Neon Amber	75p
RX83E	Pan Neon Red	75p
RX81C	Square Neon Red	33p
RX98G	Square Neon Green	33p
RX70M	Wire Neon	14p
WQ13P	Wire Bulb 12V	30p
WL74R	LES Bulb 6V	17p
WL75S	LES Bulb 12V	15p■
RX84F	Neon Bulb	99p

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WL76H	Bulb MES 3.5V	35p
WL77J	Bulb MES 6V 0.24W	36p
WL78K	Bulb MES 6V 6W	31p
WL79L	Bulb MES 6.5V	25p
WL80B	BUlb MES 12V 1.2W	28p
WL81C	Bulb MES 12V 2.2W	29p
WL82D	Bulb MES 24V	36p
LQ10L	Portable Lamp	£6.95■
XY71N	Caravan Lamp	£9.65
LQ11M	12V Tube	£1.38
LL15R	240V Inspection Lamp	£5.60
XQ15R	Bulkhead	£4.35
XR64U	Festoon Cable	DIS
YW45Y	Festoon Lampholder	DIS
HB52G	Pygmy Bulb Blue	90p
HB53H	Pygmy Bulb Green	90p
HB54J	Pygmy Bulb Red	90p
HB55K	Pygmy Bulb White	70p
HB56L	Pygmy Bulb Yellow	90p
XY25C	Stay-Put Lamp	DIS
YB29G	Spot Holder	£3.85

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XY00A	3-Bank Lampholder	£13.95
XB31J	BC Clip-On Hdr Sngl	£4.99
XB32K	BC Clip-On Hdr Twin	£6.95
WF25C	Spot Lamp Amber	£2.85
WF26D	Spot Lamp Blue	£2.85
WF27E	Spot Lamp Clear	£2.35■
WF28F	Spot Lamp Green	£2.85
WF29G	Spot Lamp Red	£2.85
WF30H	Spot Lamp Violet	£2.85
WF22Y	Gooseneck Lamp	£5.32
WL32X	Mini LED Red	10p
WL33L	Mini LED Green	19p■
WL34M	Mini LED Orange	27p
YY38R	Mini LED Yellow	19p■
YY39N	Mini LED Clip	2p
WL27E	LED Red	12p■
WL28F	LED Green	19p■
WL29G	LED Orange	33p
WL30H	LED Yellow	17p■
YY40T	LED Clip	2p
QW96E	Square LED Red	36p
YH60Q	Square LED Green	36p
YH61R	Square LED Yellow	40p
YH62S	Square LED Clip	7p
YY41U	Large LED Red	£1.49■
YY42V	Large LED Clip	21p

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YY45Y	Shape LED R1 Red	20p
YY46A	Shape LED R1 Green	25p
YY47B	Shape LED R1 Orange	37p
YY48C	Shape LED R1 Yellow	27p
YY49D	Shape LED S2 Red	20p
YY50E	Shape LED S2 Green	27p
YY51F	Shape LED L3 Red	21p
YY52G	Shape LED L3 Green	26p
YY53H	Shape LED L3 Yellow	26p
YY54J	Shape LED T4 Red	22p
YY55K	Shape LED T4 Green	26p
YY56L	Shape LED T4 Yellow	26p
YY57M	Shape LED A5 Red	23p
YY58N	Shape LED A5 Green	27p
YY43W	Illuminator Orange	JULY 82
YY44X	Illuminator Yellow	JULY 82
YH53H	Cliplite Amber	16p
YH54J	Cliplite Clear	16p
YH55K	Cliplite Green	16p
YH56L	Cliplite Red	16p
YH57M	Cliplite Yellow	16p
YY61R	Multicolour LED	59p
YY59P	Chrome LED Small	52p
YY60Q	Chrome LED Large	54p
BY65V	Red Bargraph Dslpy	£3.25
YG33L	Green Bargraph Dslpy	£2.95
YG34M	Ornge Bargraph Dsply	£2.95
YG35Q	Yllow Bargraph Dsply	£3.35

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FR36P	7-Seg Red Type 1	£1.07
FR37S	7-Seg Red Type 3	DIS
FR38R	7-Seg Red Type 4	£1.25■
FR39N	"1/2" Display Type 1	99p
†FR40T	"1/2" Display Type 3	£1.98
FR41U	"1/2" Display Type 4	£1.07
BY66W	DD Display Type A	£1.98
BY67X	DD Display Type AF	50p
BY68Y	DD Display Type C	£1.98

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XX08J	4-Dig Dspy Cmn Cath	£2.69
BY70M	4 Dig Dis Cmn Anode	£1.50
HQ36P	Mult Cmn Cath Disply	£3.45
FR32K	Filter Amber	85p
FR33L	Filter Green	£1.20
FR34M	Filter Red	85p
FR35Q	Filter Yellow	65p
FY89W	Lqd Crystal Display	£5.50

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WL35Q	Opto-Isolator	69p■
YY62S	Dual Opto-Isolator	£1.31
YY63T	Quad Opto-Isolator	£2.86
WQ70M	Darlington Isolator	£1.52
YY64U	SCR Isolator	£2.12
QQ10L	Triac Isolator	£1.55■

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YH70M	IR Emitter TIL38	49p
YH71N	Photodiode TIL100	89p
YY65V	Infra-Red Source	38p
YY66W	Infra-Red Sensor	31p
BL23A	MS4A	£2.95
QF30H	BPX25	£1.98

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HQ61R	MEL 12	38½p
YQ62S	Xenon Tube	£2.40
YQ63T	Trigger Transfmr	49p
*XR56L	1mm Light Guide	67p
XL11M	Laser Tube	£124.00
HY19V	5KV Laser PCB	£4.50
HQ63T	Lens	£2.15
HQ64U	Lensholder	69p

ORGAN PARTS

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QL02C	SAM77	£1.20

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XB10L	DMO2	£14.82
XB11M	DMO2T	£16.82

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XL08J	Short Spring Line	£5.53
XB84F	Long Spring Line	£11.13
XB85G	MES Driver Module	£6.95
YL17T	Reverb PSU Module	£4.73
XB17T	Mid Kbd 49-Note C-C	£20.87
XB13P	KB Mounting Strip	39p

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XB14Q	Keyboard 48-Note	£23.94
XB15R	Keyboard 49-Note	£23.95
XB16S	Keyboard 61-Note	£28.95
XB94C	Contact Block 1WG	25p
XB01B	Contact Block GJ	37p
XB02C	Contact Block GB2	67p
XB03D	Contact Block GC3	63p
XB04E	Earth Bar	23p
XB00A	Gold Wire	£1.10
XB86T	Spacesnd Mid-Range	£52.66

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XB87U	Rotating Horns Unit	£79.30
FL66W	Stop Tab Black	75p
FL67X	Stob Tab Blue	75p
FL68Y	Stop Tab Green	75p
FL69A	Stop Tab Grey	75p
FL70M	Stop Tab Ivory	75p
FL71N	Stop Tab Maroon	75p
FL72P	Stop Tab Orange	75p
FL73Q	Stop Tab Red	75p
FL74R	Stop Tab White	75p
FL75S	Stop Tab Yellow	75p
BR05F	S Tab Acc Del Trem	£1.10
BR47B	S Tab Bass Guitar	£1.10
BR67X	S Tab Bourdon 8'	£1.10
BR06G	S Tab Cello 16'	£1.10
BR07H	S Tab Clarinet 8'	£1.10
BR08J	S Tab Clarion 4'	£1.10
BY00A	S Tab Clavichord	£1.10
BY01B	S Tab D/B to Rotor	£1.10
BY02C	S Tab Dly Vbrato Acc	£1.10
BY03D	S Tab Dly Vbrto Solo	£1.10
BR09K	S Tab Diapason 8'	£1.10
BR68Y	S Tab Diapason 16'	£1.10
BR10L	S Tab Drawbars Acc	£1.10
BR11M	S Tab Drawbars Solo	£1.10
BR12N	S Tab Dulciana 8'	£1.10
BR13P	S Tab Flute 1'	£1.10
BR14Q	S Tab Flute 2'	£1.10
BR15R	S Tab Flute 2.2/3'	£1.10
BR16S	S Tab Flute 4'	£1.10
BR17T	S Tab Flute 5.1/3'	£1.10
BR18U	S Tab Flute 8'	£1.10
BR19V	S Tab Flute 16'	£1.10
BR20W	S Tab French Horn 8'	£1.10
BR21X	S Tab Gedeckt 8'	£1.10
BY05F	S Tab Gedeckt 16'	£1.10
BY06G	S Tab Honky Tonk	£1.10
BR22Y	S Tab Horn 8'	£1.10
BY07H	S Tab Mixture 16'	£1.10
BR23A	S Tab Oboe 8'	£1.10
BR24B	S Tab Octave 4'	£1.10
BR25C	S Tab Pedal Sustain	£1.10
BY08J	S Tab Piano	£1.10
BY09K	S Tab Presets Cancel	£1.10
BY10L	S Tab Prsts to Rotor	£1.10
BY11M	S Tab Reed 4'	£1.10
BR26D	S Tab Reverb	£1.10
BY12N	S Tab Rotor Fast	£1.10
BY13P	S Tab Rotor To Main	£1.10
BR27E	S Tab Salicet 4'	£1.10
BR28F	S Tab Salicional 8'	£1.10
BR29G	S Tab Saxophone 16'	£1.10
BR30H	S Tab Solo Del Trem	£1.10
BR31J	S Tab String 4'	£1.10
BR32K	S Tab String 8'	£1.10
BR33L	S Tab Sub Bass 16'	£1.10
BY14Q	S Tab Sustain Acc	£1.10
BY15R	S Tab Sustain Solo	£1.10
BR34M	S Tab Tremulant	£1.10
BR35Q	S Tab Trumpet 8'	£1.10
BR36P	S Tab Tuba 16'	£1.10
BY16S	S Tab Vibrato	£1.10
BR37S	S Tab Vox Anglica 8'	£1.10
BR38R	S Tab Vox Humana 8'	£1.10
BY17T	Mar Ky Tab Cello 16'	£2.95
BY18U	Mar Key Tab Clar 8'	£2.95
BY19V	Mar Ky Tab Clrion 4'	£2.95
BY20W	Mar Key Tab Clav	£2.95
BY21X	Mar Ky Tb D/B to Rtr	£2.95
BY22Y	Mr Ky Tb Dly Vbr Acc	£2.95
BY23A	Mr Ky Tb Dly Vbr Slo	£2.95
BY24B	Mar Key Tab Diap 8'	£2.95
BY25C	Mar Key Tab Diap 16'	£2.95
BY26D	Mar K Tab Dbar Acc	£2.95
BY27E	Mar K Tab Dbar Solo	£2.95
BY28F	Mar Key Tab Dulc 8'	£2.95
BY29G	Mar Key Tab Flute 1'	£2.95
BY30H	Mar Key Tab Flute 2'	£2.95
BY31J	Mr Ky Tb Flte 2.2/3'	£2.95
BY32K	Mar Key Tab Flute 4'	£2.95
BY33L	Mr Ky Tb Flte 5.1/3'	£2.95
BY34M	Mar Key Tab Flute 8'	£2.95
BY35Q	Mar Ky Tab Flute 16'	£2.95
BY36P	Mr Ky Tb Frch Hrn 8'	£2.95
BY37S	Mar Key Tab Gedkt 8'	£2.95
BY38R	Mr Key Tab Gedkt 16'	£2.95
BY39N	Mar Key Tab Hnky Tnk	£2.95
BY40T	Mar Key Tab Horn 8'	£2.95

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BY41U	Mar Key Tab Mix 16'	£2.95
BY42V	Mar Key Tab Oboe 8'	£2.95
BY43W	Mar Key Tab Octve 4'	£2.95
BY44X	Mar Key Tab Pdl Sus	£2.95
BY45Y	Mar Key Tab Piano	£2.95
BY46A	Mr Ky Tb Prsts Cncl	£2.95
BY47B	Mr Ky Tb Prsts To Rr	£2.95
BY48C	Mar Key Tab Reed 4'	£2.95
BY49D	Mar Key Tab Reverb	£2.95
BY50E	Mar Key Tab Rtr Fst	£2.95
BY51F	Mr Ky Tb Rtr To Main	£2.95
BY52G	Mar Ky Tab Salict 4'	£2.95
BY53H	Mar Key Tab Salic 8'	£2.95
BY54J	Mar Key Tab Sax 16'	£2.95
BY55K	Mar Key Tab Strng 4'	£2.95
BY56L	Mar key Tab Strng 8'	£2.95
BY57M	Mar Ky Tb Sb-Bss 16'	£2.95
BY58N	Mar Key Tab Sus Acc	£2.95
BY59P	Mar Key Tab Sus Solo	£2.95
BY60Q	Mar Key Tab Trmpt 8'	£2.95
BY61R	Mar Key Tab Tuba 16'	£2.95
BY62S	Mar Key Tab Vibrato	£2.95
BY63T	Mar K Tab Vox Ang 8'	£2.95
BY64U	Mar K Tab Vox Hum 8'	£2.95
FL76H	Key Tab	90p
BR46A	ST Strip	£1.35
XX13P	KT Strip	£1.50
BR41U	Drawbar Red	£1.35
BR42V	Drawbar White	£1.35
XB18U	Contact Pedal Board	£22.30
XB19V	Free-Stdg Pedalboard	£63.00

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XB99H	Pdl Unit Front Panel	£2.95
XB96E	32-Note Pdlbd	£135.41
	Carr in UK with XB96	£14.30
XB22Y	Control Lever	£7.73
XB21X	Piano Pedal	£9.85
XB20W	Swell Pedal	£8.50
XY28F	Remote Foot Control	£9.85

PANEL METERS

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RW74R	Level Meter	£4.35
LB80B	Sig Strength Meter	£1.95
LB79L	Tuning Meter	£1.95■
RW73Q	VU Meter V41	£2.20
YQ47B	Dual VU Meter	£3.90
RW97F	2in.Pn Mtr 50-0-50uA	£6.65
RW98G	2inPn Mt 100-0-100uA	£6.65
RW99H	2inPn Mt 500-0-500uA	£6.65
RW91Y	2in. Pan Meter 50uA	£5.55■
RW92A	2in. Pan Meter 100uA	£5.55
RW93B	2in. Pan Meter 500uA	£6.45
RW94C	2in. Pan Meter 1mA	£6.45
RW95D	2in. Pan Peter 5mA	£6.45
RW96E	2in. Pan Meter 10mA	£6.45
RX32K	2in. Pan Meter 50mA	£6.65
RX33L	2in. Pan Meter 100mA	£5.55■
RX34M	2in. Pan Meter 500mA	£6.45
RX35Q	2in. Pan Meter 1A	£6.65
RX36P	2in. Pan Meter 50V	£6.65
RX37S	2in. Pan Meter 300V	£5.90
RX52G	2in. Pan Meter 'S'	£6.65
RX53H	2in. Pan Meter 'VU'	£6.65

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YG17T	Meter MS45 100uA	DIS
YG18U	Meter MS45 1mA	DIS
YG19V	Meter MS45 VU	£4.45
RX54J	Large Panel Meter	£7.59
RX55K	Illuminating Kit	DIS
RX92A	Meter MI 15V	£6.75
RX87U	Meter MI 60V	£6.35
RX88V	Meter MI 300V	£7.96
RX89W	Meter MI 1A	£6.20
RX90X	Meter MI 5A	£6.20
RX91Y	Meter MI 15A	£7.65■
RX93B	Meter MI 25A	£7.95

PCB EQUIPMENT

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FL01B	SRBP 0.1in Type 2	DIS
FL02C	SRBP 0.1in Type 3	99p
YR80B	SRBP 0.1in Type 4	DIS
FL06G	Vero 14354	25p
FL07H	Vero 10345	£1.06
FL08J	Vero 10346	89p
FL09K	Vero 10347	£1.19
FL10L	Vero 10348	£1.05
YR81C	Vero 21002	£2.95
FL53H	Vero 10401	£3.65
FL17T	Verostrip	99p
FL19V	DIP Board	£4.35
HQ48C	Vero V-Q Board	£1.95
FL25C	Tool 2022	£1.29
FL26D	Tool 2150	£1.75
FL27E	Tool 2151	£1.95
FL20W	Pin 2140	55p
FL21X	Pin 2141	55p
FL23A	Pin 2144	55p
FL24B	Pin 2145	57p

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FL80B	Pin 0266 Pk of 10	25p
FL81C	Pin 1657 Pk of 10	35p
FL82D	Track Pin	85p
FL28F	4-Way Tag	12p
FL29G	Mounting Strip	32p
FL11M	Tag Board	94p
YL11M	Vero Plugblock	£4.95
YR83E	Eurobreadboard	£6.75
YR84F	Prof Plugblock	£6.95

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YR85G	Bus-Strip Plugblock	£2.95
YR86T	Plugblck Contct Strp	28p
YR87U	Plugblock PCB	£1.85
XB43W	Seno Etch System	£5.95
XY10L	UV Exposure Box	£41.32
BW19V	Photo-Etch PCB	£2.95
BW20W	Phot-Etch Drftg Pk	£1.95

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XX12N	Etch Crystals	£1.25
WF10L	Etcher Fluid	£2.25
HX02C	PCB Pen	£1.35
HX03D	Resist Remover	88p
HX00A	PCB SRBP Smll Single	48p
WF38R	PCB SRBP Med Single	96p■
WF39N	PCB SRBP Lrg Single	£1.25■
HX01B	PCB F.Glass Sm Sngl	85p
WF40T	PCB F.Glass Med Sngl	£1.75
WF41U	PCB F.Glass Lrg Sngl	£2.75
WF42V	PCB F.Glass Med Dble	£1.39
XB90X	Fixircuit	£8.75
BW21X	Track Tape 31	91p
BW22Y	Track Tape 40	91p
BW23A	Track Tape 50	91p
BW24B	Track Tape 62	£1.32
BW25C	Track Tape 80	£1.32
BW26D	Track Tape 100	£1.32
BW27E	Track Tape 125	£1.85
BW28F	Track Tape 150	£1.85
BW29G	Track Tape 200	£1.85
BW30H	Pad 075	£1.55
BW31J	Pad 100	£1.55
BW32K	Pad 125	£1.12
BW33L	Pad 150	£1.12
BW34M	Pad 200	£1.50
BW35Q	Pad 300	£1.50
BW36P	Pad 400	£2.55
BW37S	Pad 500	£3.95
BW38R	Pad 600	£5.25

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BW40T	IC Pads 200	£4.65
BW41U	Drafting Template	88p
HX45Y	Transfer Sheet 1	42p
HX46A	Transfer Sheet 2	42p
HX47B	Transfer Sheet 3	42p
HX48C	Transfer Sheet 4	42p
HX49D	Transfer Sheet 5	42p
HX63T	Transfer Sheet 6	42p
HX64U	Transfer Sheet 7	42p
HX65V	Transfer Sheet 8	42p
HX66W	Transfer Sheet 9	42p
HX67X	Transfer Sheet 10	42p
HX68Y	Transfer Sheet 11	42p
HX83E	Transfer Sheet 12	42p
HX84F	Transfer Sheet 13	42p
HX44X	Transfer Kit	£3.75

PROJECTS

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XF11M	MES12	£2.00NV
XH24B	MES15	15pNV
XH27E	MES16	15pNV
XH18U	MES22	25pNV
XH06G	MES24	FREE
XH20W	MES25	25pNV
XF03D	MES26	£1.20NV
XH51F	MES30	20pNV
XH07H	MES32	20pNV
XH48C	MES33	40pNV
XH21X	MES37	25pNV
XF04E	MES41	40pNV
XH23A	MES42	25pNV
XH49D	MES47	DIS
XH19V	MES49	DIS
XH00A	MES51	15pNV
XH02C	MES52	15pNV
XH04E	MES53	35pNV
XH31J	MES54	30pNV
XH33L	MES55	30pNV
XH35Q	MES56	NYA
XH26D	MES71	30pNV
XH50E	MES93	DIS
XF36P	81 Maplin Catalogue	£1.25NV
XF08J	MES120	FREE
LW50E	Electronics For All	£29.95

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BR45Y	AS314	33p
BR88V	Mk/Space Adptr Kit	£3.95
YL20W	Mstr Tuning Module	£19.87
BB00A	Divider Board 'A'	£4.35
BB01B	Divider Board 'B'	£3.20
BB02C	Tone Board 'A'	£4.45
BB03D	Tone Board 'B'	£1.98■
BB07H	Control Board 'A'	£4.25
BB08J	Control Board 'B'	£2.98
BB09K	Sawtooth Board 'A'	£4.25
BB10L	Sawtooth Board 'B'	£4.85
BB11M	Gate Board	44p
BB04E	Tone Board 'C'	£4.85
BB05F	Tone Board 'D'	£4.82
BB06G	Tone Board 'E'	£4.55
BB12N	Pedal PCB 'A'	£2.20
BB15R	Mother Board 'A'	£10.30
BB13P	A/B Switch Board	£1.68
BB14Q	MES Amp Board 'A'	72p
BB77J	Divider MO & Frq Gen	£4.95
BB78K	Pedal PCB 'B'	£3.87
BB79L	32-Note Pedal Voice	£4.45
BB80B	Pedal Diode PCB	£1.65
HQ72P	Auto Ogn Gen/Clk PCB	£3.95
HQ73Q	Auto Ogn Crd Cdr PCB	£3.75
HQ74R	Auto Ogn Auto St PCB	£5.95
HQ75S	Auto Ogn PA/PSU PCB	£4.35
YL00A	Organ Mixer PCB	£3.25
YL18U	Power Supply 2G05	£1.35
YL21X	32 Note Pdl PSU PCB	£2.95
XX38R	Downbeat Indictr PCB	£2.20
XH00A	MES51	15pNV
XH02C	MES52	15pNV
XH04E	MES53	35pNV
XH31J	MES54	30pNV
XH33L	MES55	30pNV

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XF11M	MES12	£2.00NV
BB41U	Synth Mixer PCB	£3.95
BB44X	Synth VCA PCB	£1.36
BY87U	Synth Preset Mtg Bd	65p
BY88V	Synth 1979 Kybd Cont	£5.95
BY89W	Synth Binary Encoder	£7.95
BB40T	Synth PSU Mk.II PCB	£4.95
BY90X	Synth Smpl & Nse PCB	£3.95
BB43W	Synth Trns Gen 1 PCB	£3.20
BB45Y	Synth Trns Gen 2 PCB	£3.20
BY81C	Synth Trns Rept PCB	£1.24
BY82D	Synth Rvrb & Phs PCB	£3.20
BY83E	Synth VC Pn & AncPCB	£6.65■
BB38R	Synth Oscillator PCB	£3.25
BB48C	Synth Ext I/P's PCB	£1.54■
BB65V	3600 VCF PCB	£2.17
BB64U	4600 Hinge	63p
BB63T	Synth Ext I/P's Bkt	64p
BB49D	Synth Oscltr Mtg Bkt	67½p
BB52G	Synth Mixer Chassis	£2.10
BB51F	Synth Pwr Sply Htsnk	£1.30
BB56L	Synth Mixer Mtg Bkt	16p
BB58N	Synth Trns 1/Env Bkt	69p
BB59P	Synth Trns 2 Mtg Bkt	£1.20
BB60Q	Synth VCA Mtg Bkt	52p
BB61R	Synth VCF Mtg Bkt	64p
BF95D	Joylever PCB	99p
XQ01B	5600 Front Panel	£13.50
	Carr in UK with XQ01	£9.00
BY84F	5600 Rear Panel	£4.55
XQ02C	5600 Cabinet	£55.23
	Carr in UK with XQ02	£9.00
XB79L	Teak 5600 Cabinet	£55.70
	Carr in UK with XB79	£7.00

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BY86T	3800 Interface PCB	£2.29
BB47B	Synth Otpt Stge PCB	£4.55■
XQ03D	3800 Front Panel	£9.73
	Carr In UK With XQ03	£8.00
BF96E	3800 Sp.Ext.I/P.Bkt	55p
BF98G	3800 VCA Bkt	55p
BF99H	3800 Intface Mtg Bkt	55p
*BB67X	3600 VCF Mtg Bkt	59p
BY85G	3800 Rear Panel	£4.56
XQ04E	3800 Cabinet	£49.60
	Carr in UK with XQ04	£9.00
YQ46A	Synth Demo Tape	£4.50
XF41U	Synth Guide Book	£2.00NV
XF42V	5600S Patch Chart	7pNV
XF43W	3800 Patch Chart	7pNV
XF10L	ETI Top Project No.5	£1.25NV
BB76H	Touch Organ PCB	£5.99

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XH18U	MES22	25pNV
BY78K	Piano PSU/Voice PCB	£4.45
BY79L	Piano Top Oct PCB	£4.95
BY80B	Piano Two-Oct PCB	£5.55
XF03D	MES26	£1.20NV
BB28F	RC Coder PCB	£1.95
BB29G	RC Xmitter PCB	£1.92
BB30H	RC Receiver PCB	£1.45
BB31J	RC Interface PCB	£1.55
BB32K	RC Decoder PCB	£1.35
BB33L	RC Relay Drive PCB	94p
BB34M	RC Servo Drive PCB	82p
BB35Q	RC Servo Amp PCB	92p
BB36P	RC Tone Gen PCB	85p
BB37S	RC Tone Decoder PCB	85p
YQ03D	McM Encoder PCB	£1.10
YQ04E	McM Receiver PCB	£1.18
YQ05F	McM Rcvr Dcdr PCB	£1.05
YQ07H	McM Transmitter PCB	£1.95■
YQ06G	McM Stereophoner PCB	£1.10
XQ06G	Piano Cabinet Black	£54.60
XY11M	Piano Cabinet Teak	£63.63
YQ08J	McM Elect Ig/Cnv PCB	£1.60■
YQ09K	McM Flasher PCB	£1.10■

1981 Catalogue Page No.		VAT inclusive PRICE
YQ19V	LM380 Amp PCB	£1.25■
YQ20W	20W Amp PCB	£1.50
YQ18U	Tone Con PCB	£1.55■
YQ21X	Snd/Light Conv PCB	£2.10

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XH20W	MES25	25pNV
BB16S	Orgn/Gtar Bass PCB	£10.50
XH19V	MES49	DIS
XL13P	Drumsette Kit	DIS
XX16S	Drumsette 1 PCB	DIS
XX17T	Drumsette 2 PCB	DIS
LY01B	Drumsette Frnt Panel	DIS
†LY02C	Drumsette Rear Panel	£1.93
†HY02C	Drumsette Bkt Set	£2.65
XB98G	Drumsette Cabinet	DIS

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XH48C	MES33	40pNV
FL94C	HiFi Amp Sel Mthr PC	£4.20
FL95D	HiFi Amp Sel PCB	£2.29
FL96E	HiFi Amp Eql Mthr PC	£2.95
FL97F	HiFi Amp Eql PCB	£1.97
FL98G	HiFi Amp Pk Det PCB	95p
FL99H	HiFi Amp PSU PCB	£1.65
XX32K	.H/Phones Skt Brckt	52½p
XY21X	HiFi Amp Chassis	£18.93
XY22Y	HiFi Amp Screen	£1.85
XY23A	HiFi Amp Frt Panel	£8.30
XY24B,	HiFi Amp Cover Black	£6.95

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LW40T	Tuner Metalwork Kit	£42.88
LW41U	Tuner PSU Module	£23.95
LW42V	Tuner Switching Mod.	£18.95

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LW45Y	TV Sound Tuner	£39.55
LW44X	Tuner Head EF5600U	£23.79
LW43W	Tuner IF Module	£18.98
LW46A	AM Tuner	£17.95
LW48C	Stereo Tuner Kit	£161.00
YQ00A	IF Tuner Mono Module	£9.50■
YQ10L	12/30V PSU Module	£6.70

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XH07H	MES32	20pNV
BB55K	Dyn Noise Filter PCB	£2.20
XB05F	Dyn Noise Fltr Mwrk	£9.95

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XH21X	MES37	25pNV
XX03D	10-Channel G.E. PCB	£1.95
XB74R	10-Chl Eqlsr Mtwrk	£10.45
XB75S	10-Chl Eqlsr Wwrk	£5.50
HY21X	Clock Timer PCB	DIS
†LW30H	Clock Timer Case	£12.90
LW31J	Clock Timer Kit	£43.57
XY32K	Cassette Mechanism	£14.95
XY34M	Stereo Tape Module	£19.73
YQ30H	Tape Switch Board	42p
YQ33L	Tape Switch Bracket	51p
YQ31J	Tape PSU PCB	39p
XY35Q	Cassette Parts Kit	£12.98
XY36P	Cassette Recrder Kit	£39.95

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XF04E	MES41	40pNV
XB76H	Disco Front Panel	£11.50
BB26D	Motor Switch PCB	£1.15
BB27E	Light Mod Bd	£4.85
BB18U	Heatsink DR2	74p
XB77J	Disco Cabinet	£48.44
	Carr in UK with XB77	£8.00
BB81C	Disco Pre-Amp Tn PCB	£4.45
BB19V	Disco PSU PCB	£1.95
BB20W	100W Amp Board	£2.35
XY26D	Heatsink Mtg Plate	£3.95
XY27E	Heatsink Cover	£6.45
BB22Y	FET-Ceramic PU Bd	£1.65
BB24B	Disco Fader Bd	£1.95
BB25C	VUM & HP Amp Bd	£2.35■
XH23A	MES42	25pNV
XB37S	Sound To Light Case	£11.50

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LR13P	HQ Mixer PCB No.2	£1.96
LR14Q	HQ Mixer PCB No.3	£1.55
LR15R	HQ Mixer PCB No.4	£1.35
LR34M	HQ Mixer PCB No.24	£1.98

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LR16S	HQ Mixer PCB No.5	99p
LR35Q	HQ Mixer PCB No.25	£1.60
LR21X	HQ Mixer PCB No.6	88p■
LR22Y	HQ Mixer PCB No.7	£1.75
LR23A	HQ Mixer PCB No 8	£1.60

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LR24B	HQ Mixer PCB No.9	99p■
LR42V	HQ Mixer PCB No. 29	£1.98
LR25C	HQ Mixer PCB No.10	£1.85
LR26D	HQ Mixer PCB No.14	£1.87

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LW35Q	50W Amp Kit	£14.95

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HQ68Y	50W Hi-Fi PCB	£2.85
LW32K	150W Power Amp Kit	£17.95

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BY74R	Michron MkII PCB,	DIS
†YB92A	Michron MkII Case	£6.81
†LW37S	Michron MkII Clk Kit	£19.40

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XL07H	MA1003	DIS
YL19V	L.C.Clock Module	£13.40

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LW39N	Burglar Alarm Kit	DIS
LW38R	Ultrasonic Dtctr Kit	DIS

1981 Catalogue Page No.		VAT inclusive PRICE
XH49D	MES47	DIS
YQ52G	Ultrason Tx PCB	DIS
YQ53H	Ultrasonic Rx PCB	DIS
BY92A	Burglar Alarm PCB	DIS
BY93B	External Alarm PCB	DIS
BY95D	Alarm Box Bracket	DIS
XY14Q	External Alarm Box	£12.80
XY13P	Burglar Alarm Box	DIS
BB72P	Sine/Square Gen PCB	£2.95
BB73Q	Audio Osc Frt Panel	£1.74
XH24B	MES15	15pNV
XH27E	MES16	15pNV
XX40T	Ignition PCB	£1.30
XX41U	Ign Mtg Plate	£1.28

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XH26D	MES71	30pNV
BB82D	Keyboard PCB	£7.35
BB83E	VDU Logic PCB	£9.50
BB98G	VDU PSU PCB	£2.98
XY12N	VDU Front Panel	£7.90
XX05F	UHF Mod No 2	£4.99
XF44X	Magnum Booklet	50pNV
YQ44X	Magnum 1 PCB	£2.95
YQ45Y	Magnum 2 PCB	£2.95

PROTECTION

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RX96E	Safuseholder 20	45p
RX97F	Safuseholder 1.1/4in	75p■
RX49D	Chassis F/H 20mm	11p
RX50E	Chassis F/H 1.1/4 in	17p
WH49D	Fuse Clip	2½p
RX51F	F/H Car	10p
WR93R	Fuse 20mm 50mA	6p
WR00A	Fuse 20mm 100mA	6p■
WR94C	Fuse 20mm 150mA	6p
WR01B	Fuse 20mm 250mA	6p
WR02C	Fuse 20mm 500mA	6p
WR03D	Fuse 20mm 1A	8p
WR04E	Fuse 20mm 1.5A	6p
WR05F	Fuse 20mm 2A	8p
WR06G	Fuse 20mm 3A	8p
WR07H	Fuse 20mm 5A	6p
WR18U	Fuse A/S 500mA	12p
WR19V	Fuse A/S 1A	12p
WR20W	Fuse A/S 2A	12p
WR95D	Fuse 1.1/4 50mA	4p
WR08J	Fuse 1.1/4 100mA	6p
WR96E	Fuse 1.1/4 150mA	8p
WR09K	Fuse 1.1/4 250mA	7p
WR10L	Fuse 1.1/4 500mA	6p
WR11M	Fuse 1.1/4 1A	6p
WR12N	Fuse 1.1/4 1.5A	6p
WR13P	Fuse 1.1/4 2A	7p
WR14Q	Fuse 1.1/4 3A	6p
WR15R	Fuse 1.1/4 5A	6p
WR16S	Fuse 1.1/4 10A	6p
WR17T	Fuse 1.1/4 15A	12p
HQ31J	Plug Fuse 2A	15p
HQ32K	Plug Fuse 3A	14p
HQ33L	Plug Fuse 5A	15p
HQ34M	Plug Fuse 13A	14p
HB51F	Fuse Wire	30p
HW04E	RF Supp Choke 1A	26p
HW05F	RF Supp Choke 2A	29p
HW06G	RF Supp Choke 3A	39p

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HW13P	Mains Trans Supp	65p
HW07H	Delta Cap	97p
YR90X	R-C Network	£1.39
YW46A	Door Contact Reed	£1.49■
YW50E	Window Foil	£1.25■
YW51F	Foil Terms	65p
YW47B	Surface BA Reed	£1.95■
YW48C	Door Loop	£1.75■
YW49D	BA Junction Box	59p■
YB91Y	Pressure Mat	£3.55
XY33L	Smoke Detectr Type 1	£12.75

RECORD AND TAPE

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XQ00A	Autochanger	£22.50
XB23A	Rim Drive Turntable	£29.90
XB25C	Belt Drive Turntable	£34.50■

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FQ17T	Cartridge Slide MP60	£2.68
FQ18U	Cartridge Slide 710	DIS
FQ19V	Crtridge Slide BDS95	DIS
LB75S	Drive Wheel BSR	£1.55
FQ20W	Spindle Auto BSR	£5.30
FQ21X	Spindle Manual BSR	56p
YW58N	BSR Drive Belt	£2.20
FQ22Y	Carrier Kit SL75K	£4.25
FQ23A	Cartrdg Carrier SL95	£3.95
FQ24B	Carrier Kit SL95K	£5.25
FQ25C	Crtrdg Car Zero 100	£4.45
FQ26D	Cartrdg Car SP25II	£4.45
FQ28F	Cartrdg Crrier SP25V	£4.25
FQ29G	Carrier Kit SP25VK	£5.95
LB76H	Dr Wheel Garrard Lrg	£1.85
FQ30H	Dr Wheel Garrard Sm	£2.85
FQ31J	Spindle Man Short	65p
FQ32K	Spindle Man Long	79p
FQ33L	Spindle Auto Short	£4.50
FQ34M	Spindle Auto Long	£4.85
YB43W	SP25IV Tone Arm	DIS
FQ35Q	CB Weight SP25IV	£3.95
FQ36P	Garrard Drive Belt	£2.50■
YB44X	SP25III Motor	DIS
YB45Y	SP25IV Motor	DIS

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XX34M	Headshell	£3.50
HR01B	Ctrdg BSR X5M	£3.65
HR02C	Ctrdg BSR X5H	£3.65
HRC4E	Ctrdg BSR SX6M	£4.25
HR05F	Ctrdg BSR SX6H	£4.25
YX76H	Drive Belt 46mm	98p
YX77J	Drive Belt 57mm	98p
YX78K	Drive Belt 66mm	98p
YX79L	Drive Belt 76mm	98p
YX80B	Drive Belt 90mm	98p
HR06G	Ctrdg Acos 104	DIS
HR09K	Ctrdg BSR SC12M	£3.75
HR10L	Ctrdg BSR SC12H	£3.40
YX83E	Ctridge Philps GP215	£4.55

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FY75S	Ctrdg Rigonda 2SB	£4.45

1981 Catalogue Page No.		VAT inclusive PRICE
HR11M	Ctrdg Sono 9TAHC	£5.93
HR12N	Ctrdg Sono 3509	£4.95
HR13P	Ctrdg Sono 3549	£3.75■
HR14Q	Ctrdg Sono 3559	£5.25
HR17T	Ctrdg Sono V100	£5.98
YX81C	Cartridge QLM30	£9.55
YX82D	Cartridge QLM36	£21.40
HR15R	Ctrdg Goldring G850	£5.70
HR16S	Ctrdg Goldring G800	£7.40

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FQ38R	Ctrdg Goldring G800H	£9.49
FQ39N	Ctrdg Goldring G800E	£11.95■
FQ40T	Ctrdg Tenorel T2001D	£4.85
FQ41U	Cdg Tenorel T2001ED	£9.95

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HR25C	Stylus GP91SC DD	98p
HR28F	Stylus GP93 DD	£1.10
HR65V	Stylus GP95 DD	£1.15
HR31J	Stylus GP104 DD	89p
HR66W	Stylus Acos SM6	£4.35
YX05F	Stylus ADCRK8	£6.45
YX06G	Stylus ADC RSQ30	£7.85
YX07H	Stylus ADC RSQ36	£16.35
YX08J	Stylus AT6	£4.35
YX09K	Stylus AT70	£4.85
YX10L	Stylus ATS11E	£5.70
HR68Y	Stylus VM8	£4.85
HR39N	Stylus BSR TC8 D	29p■
HR71N	Stylus BSR ST4 DD	99p
HR42V	Stylus BSR ST10	70p
HR45Y	Stylus BSR ST15	99p
HR47B	Stylus BSR ST17 DD	89p
HR74R	Stylus BSR ST21	95p
HR75S	Stylus Decca Deram	£2.45■
YX11M	Stylus Dual DN201	£4.95
YX12N	Stylus Garrard GA150	£9.65
HR76H	Stylus D110E	£4.55
HR77J	Stylus D110H	£1.95
HR48C	Stylus D110SR	£1.95■
HR49D	Stylus D120SR	£2.45■
HR78K	Stylus Hitachi ST101	£4.85
HR79L	Stylus Hitachi ST103	£5.70
YX13P	Stylus Hitachi ST104	£4.35
*YX14Q	Stylus JVC DT21S	£4.35
FQ54J	Stylus Victor DT33	£4.35
*YX15R	Stylus JVC DT36	£4.35
HR81C	Stylus LV65977D	£1.25
HR83E	Stylus NP EPS36	£1.85
HR84F	Stylus NP EPS52	£4.55
YX16S	Stylus NP EPS53	£4.75
YX17T	Stylus Philip AG3306	99p
HR87U	Sty Philips GP200DD	£1.10
HR89W	Stylus Philips GP205	£1.25
YX18U	Stylus Philips GP213	£1.10
HR90X	Styl Philips GP400	£4.35
YX19V	Styl Philps GP400Mk2	£4.32
YX20W	Styl Philps GP401Mk2	£5.95■

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HR93B	Stylus RIG-2SB DD	£1.22
HR51F	Stylus BF40D	£1.25
HR96E	Stylus DM500/7	£4.95
YX22Y	Stylus Sanyo ST10J	£4.35
HR95D	Stylus Sansui	£4.35
YX23A	Stylus Sansui SN41	£4.35
YX24B	Stylus Sanyo ST7D	£4.75
HR97F	Stylus Sanyo 2611	£3.95
FQ48C	Stylus Sony ND128	£1.85
YX25C	Stylus Sharp 101	£4.75
HR98G	Stylus Sharp 706	£4.75
HR99H	Stylus Sharp 717	£4.35
HR60Q	Stylus 9TAHC DD	99p
HR61R	Stylus Sonotone V100	£4.75
YX26D	Stylus Sonotone V101	£4.35
FQ45Y	Stylus 2509	99p■
FQ43W	Stylus 2529 DD	£1.30
HR53H	Stylus KS40A DD	99p
HR55K	Stylus KS41B DD	£1.35
HR57M	Stylus KS41C DD	£1.10■
YX27E	Stylus Sony XL15	£4.35
YX28F	Stylus Sony ND126	£4.75
FQ49D	Stylus Sony ND133	£4.85
FQ50E	Stylus Sony ND134	£2.95■
FQ51F	Styl Tenorel N2001D	£2.37
YX29G	Styl Tenorel N2001DM	£2.75
FQ52G	Styl Tenorel N2001ED	£7.45
YX30H	Stylus Tetrad 51	£2.15
FQ53H	Stylus Toshiba N3C	£1.75
YX31J	Stylus Toshiba N55	£4.35
YX32K	Stylus Toshiba N58	£4.85
YX21X	Stylus Toshiba N550	£4.35

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YB47B	Record Care kt C106	£4.95
*LX03D	Musicentre Kit C113	£6.45
LX06G	Cleaning Arm C100	£3.25
LH89W	Cleaning Arm C108	£4.55
FR44X	Roller Pack C93	35p
YW80B	Roller Pack C96	48p
YW81C	Cleaning Cloth C104	78p
FR48C	Dust-Off C101	99p■
YW82D	Cleaner C92	£4.65■
YX93B	Stylus Microscope	£2.45
YW83E	Stylus Brush C103	12p
YW84F	Stylus Brush C97	28p
FR46A	Stylus Cleaner C95	80p
YB55K	Cleaning Kit C116	£2.42

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FR52G	Anti-Stat Fluid 69S	49p
LX10L	Anti-Stat Mat C119	£1.95
LX04E	Anti-Stat Gun	£5.25
FQ60Q	Spirit Level 44	£3.65
FR49D	Stylus Balance PX1	£2.45
YW85G	Record Grip C206	£1.28
FR50E	Gram Speed Indicator	9p
YW86T	Cassette Kit C115	£1.85
YB56L	Cassette Kit C107	£4.25
RB04E	Cass Head Clnr C118	£1.25
YW87U	Cleaning Stick C109	23p■
YW88V	Tape Cleaning Fluid	58p

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FR54J	Cassette Clnr Tape	55p■
YW89W	Cassette Cln & Demag	£2.25
FR62S	Straight Demagnetzer	£3.35
FQ62S	Curved Demagnetiser	£3.85■
*YW90X	Cassette Splicer	£4.25
YW91Y	Splicing Block	£1.85

1981 Catalogue Page No.		VAT inclusive PRICE
LX17T·	Splicing Tape	65p
RB03D	Cassette Case	23p
FR60Q	Index Cards	£1.40
RB01B	Cassette Fast Winder	£2.35
FR59P	Test Cassette 53	£4.98
YG25C	Cassette Tape C60	61p
YG26D	Cassette Tape C90	65p

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RB05F	Cassette Tray 52A	£1.87
RB07H	Rota-Rack	£2.45
LH91Y	Cassettebox	£4.65
LH92A	Videocassettebox	£9.68
FQ63T	GF Cassette Head	£11.80
FQ64U	Mono Cassette Head	£4.55
FQ66W	Cassette Erase Head	£2.55
FQ65V	Stereo Cassette Head	£4.75
FQ67X	Tape Hd Two-Track RP	£15.50

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FQ68Y	Tpe Hd Two-Trck Eras	£8.95
FQ69A	Tape hd Four-Trck RP	£15.25
FQ70M	Tpe Hd Four Trk Eras	£8.85
FQ71N	2-Head Bracket	£4.65
FQ72P	3-Head Bracket	£5.39

RESISTORS

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U	Micro Res	3p
M	Min Res	2p
S	Std Res	3p
C	1W Res	5p

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X	Oxide	5p
T	1% Res	9p
XL05F	Colour Wheel	25p
W	W/W Min Res	19p

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L	7W W/W	24p
H	10W W/W	29p
P	25 W/W Res	£1.49
V	HV Res 1M-33M	12½p
V	HV Res 47M	22p
BL64U	Constantan 28 swg	£3.35
YY12N	Resnet 100R	85p
YY13P	Resnet 220R	85p
YY14Q	Resnet 470R	85p
YY15R	Resnet 1k	85p
YY16S	Resnet 2k2	85p
YY17T	Resnet 4k7	85p
YY18U	Resnet 10k	85p
YY19V	Resnet 22k	85p
YY20W	Resnet 47k	85p
YY21X	Resnet 100k	85p
WR52G	Hor S-Min Prest 100R	10p
WR53H	Hor S-Min Prest 220R	10p
WR54J	Hor S-Min Prest 470R	10p
WR55K	Hor S-Min Prest 1k	10p
WR56L	Hor S-MIn Prest 2K2	10p
WR57M	Hor S-Min Prest 4k7	10p
WR58N	Hor S-Min Prest 10k	10p
WR59P	Hor S-Min Prest 22K	10p
WR60Q	Hor S-Min Prest 47k	10p
WR61R	Hor S-Min 100k	10p
WR62S	Hor S-Min Prest 220k	10p
WR63T	Hor S-Min Prest 470k	10p
WR64U	Hor S-Min Preset 1M	10p
WR65V	Vrt S-Min Prest 100R	11p
WR66W	Vrt S-Min Prest 220R	11p
WR67X	Vrt S-Min Prest 470R	11p
WR68Y	Vrt S-Min Prest 1k	11p
WR69A	Vrt S-Min Prest 2k2	11p
WR70M	Vrt S-Min Prest 4k7	11p
WR71N	Vrt S-Min Prest 10k	11p
WR72P	Vrt S-Min Prest 22k	11p
WR73Q	Vrt S-Min Prest 47k	11p
WR74R	Vrt S-Min Prest 100k	11p
WR75S	Vrt S-Min Prest 220k	11p
WR76H	Vrt S-Min Prest 470k	11p
WR77J	Vert S-Min Prest 1M	11p

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WR78K	Hor Skeleton 100R	14p
WR79L	Hor Skeleton 220R	14p
WR80B	Hor Skeleton 470R	26p
WR81C	Hor Skeleton 1k	26p
WR82D	Hor Skeleton 2k2	26p
WR83E	Hor Skeleton 4k7	26p
WR84F	Hor Skelton 10k	26p
WR85G	Hor Skeleton 22k	26p
WR86T	Hor Skeleton 47k	26p
WR87U	Hor Skeleton 100k	26p
WR88V	Hor Skeleton 220k	26p
WR89W	Hor Skeleton 470k	26p
WR90X	Hor Skeleton 1M	26p
WR91Y	Hor Skeleton 2M2	26p
WR92A	Hor Skeleton 4M7	26p
WW00A	Vrt Skeleton 100R	24p
WW01B	Vrt Skeleton 220R	24p
WW02C	Vert Skeleton 470R	24p
WW03D	Vrt Skeleton 1k	24p
WW04E	Vrt Skeleton 2k2	24p
WW05F	Vrt Skeleton 4k7	24p
WW06G	Vrt Skeleton 10k	24p
WW07H	Vrt Skeleton 22k	24p
WW08J	Vrt Skeleton 47k	24p
WW09K	Vrt Skeleton 100k	24p
WW10L	Vrt Skeleton 220k	24p
WW11M	Vrt Skeleton 470k	24p
WW12N	Vrt Skeleton 1M	28p
WW13P	Vrt Skeleton 2M2	24p
WW14Q	Vrt Skeleton 4M7	24p
WR38R	Cermet 100R	98p
WR39N	Cermet 500R	98p
WR40T	Cermet 1k	98p
WR41U	Cermet 5k	98p
WR42V	Cermet 10k	98p
WR43W	Cermet 50k	98p
WR44X	Cermet 100k	98p
WR45Y	Cermet 1M	98p■
WR46A	15-Turn Cermet 500R	£1.20
WR47B	15-Turn Cermet 1k	£1.20
WR48C	15-Turn Cermet 5k	£1.20
WR49D	15-Turn Cermet 10k	£1.20
WR50E	15-Turn Cermet 50k	£1.20
WR51F	15-Turn Cermet 100k	£1.20
BW06G	Edge Control Pot	65p
BW07H	Edge Knob Small Blk	8p
BW08J	Edge Knob Small Grey	8p
BW09K	Edge Knob Large Blk	8p
BW10L	Edge Knob Large Grey	8p
FW00A	Pot Lin 1k	37p

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FW01B	Pot Lin 4k7	37p
FW02C	Pot Lin 10k	37p
FW03D	Pot Lin 22k	37p
FW04E	Pot Lin 47k	37p
FW05F	Pot Lin 100k	37p
FW06G	Pot Lin 220k	37p
FW07H	Pot Lin 470k	37p
FW08J	Pot Lin 1M	37p
FW09K	Pot Lin 2M2	37p
FW21X	Pot Log 4k7	37p
FW22Y	Pot Log 10k	37p
FW23A	Pot Log 22k	37p
FW24B	Pot Log 47k	37p
FW25C	Pot Log 100k	37p
FW26D	Pot Log 220k	37p
FW27E	Pot Log 470k	37p
FW28F	Pot Log 1M	37p
FW29G	Pot Log 2M2	37p

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FW41U	Sw Pot Lin 4k7	95p
FW42V	Sw Pot Lin 10k	95p
FW43W	Sw Pot Lin 22k	95p
FW44X	Sw Pot Lin 47k	95p
FW45Y	Sw Pot Lin 100k	95p
FW46A	Sw Pot Lin 220k	95p
FW47B	Sw Pot Lin 470k	95p
FW48C	Sw Pot Lin 1M	95p
FW49D	Sw Pot Lin 2M2	95p
FW62S	Sw Pot Log 4k7	95p
FW63T	Sw Pot Log 10k	95p
FW64U	Sw Pot Log 22k	95p
FW65V	Sw Pot Log 47k	95p
FW66W	Sw Pot Log 100k	95p
FW67X	Sw Pot Log 220k	95p
FW68Y	Sw Pot Log 470k	95p
FW69A	Sw Pot Log 1M	95p
FW70M	Sw Pot Log 2M2	95p
FW50E	W/W Pot 10R	£2.15
FW51F	W/W Pot 20R	£1.99
FW52G	W/W Pot 50R	£2.15
FW71N	W/W Pot 100R	£2.55
FW72P	W/W Pot 200R	£1.98■
FW73Q	W/W Pot 500R	£1.85
FW93B	W/W Pot 1k	£1.85
FW96E	W/W Pot 2k	59p
FW94C	W/W Pot 5k	99p
FW95D	W/W Pot 10k	£2.29
FX18U	W/W Pot 50k	£2.79
FW84F	Dual Pot Lin 4k7	99p
FW85G	Dual Pot Lin 10k	99p
FW86T	Dual Pot Lin 22k	99p
FW87U	Dual Pot Lin 47k	99p
FW88V	Dual Pot Lin 100k	99p
FW89W	Dual Pot Lin 220k	99p
FW90X	Dual Pot Lin 470k	99p
FW91Y	Dual Pot Lin 1M	99p
FW92A	Dual Pot Lin 2M2	99p
FX08J	Dual Pot Log 4k7	£1.10
FX09K	Dual Pot Log 10k	£1.10
FX10L	Dual Pot Log 22k	£1.10
FX11M	Dual Pot Log 47k	£1.10
FX12N	Dual Pot Log 100k	£1.10
FX13P	Dual Pot Log 220k	£1.10
FX14Q	Dual Pot Log 470k	£1.10
FX15R	Dual Pot Log 1M	£1.10
FX16S	Dual Pot Log 2M2	£1.10
FX40T	L/S Control 20R	55p
FX97F	L/S Control 50R	55p
FX98G	L/S Control 100R	55p
FX99H	L/S Control 200R	55p
YG04E	Rheostat 50R	£4.90
YG05F	Rheostat 100R	£4.90
YG06G	Rheostat 150R	£4.90
YG07H	Rheostat 200R	£4.90

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FX32K	Slide Pot Lin 5k	79p
FX33L	Slide Pot Lin 10k	79p
FX34M	Slide Pot Lin 25k	79p
FX35Q	Slide Pot Lin 50k	79p
FX36P	Slide Pot Lin 100k	79p
FX37S	Slide Pot Lin 250k	79p
FX38R	Slide Pot Lin 500k	79p
FX53H	Slide Pot Log 5k	79p
FX54J	Slide Pot Log 10k	79p
FX55K	Slide Pot Log 25k	79p
FX56L	Slide Pot Log 50k	79p
FX57M	Slide Pot Log 100k	79p
FX58N	Slide Pot Log 250k	79p
FX59P	Slide Pot Log 500k	79p
FX76H	Dual Slide Lin 5k	£1.25
FX77J	Dual Slide Lin 10k	£1.25
FX80B	Dual Slide Lin 100k	£1.25
HB02C	Dual Slide Log 10k	£1.25
HB04E	Dual Slide Log 50k	£1.25
HB05F	Dual Slide Log 100k	£1.25
HB07H	Dual Slide Log 500k	£1.25
FX07H	Slide Bezel	49p
XB09K	Joystick Pot	£6.38
XB06G	Joystick Mtg Plate	£1.66
HQ50E	2-Axis Joystick	£3.25

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FX21X	Thermistor VA1055S	38p
FX22Y	Thermistor VA1056S	35p
FX42V	Thermistor VA1066S	41p
FX43W	Thermistor VA1067S	39p
FX62S	Thermistor R53	£5.95
WH23A	Thermistor G16	£5.40
WH24B	Thermistor G23	£5.35
HB10L	LDR ORP12	£1.35
HB11M	LDR ORP60	£1.72
HB12N	LDR ORP61	DIS
HB09K	LDR RPY58A	£1.07

SEMICONDUCTORS

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QB00A	AA119	11p
QB01B	AC126	36p
QB02C	AC127	38p
QB03D	AC128	42p
QB04E	AC141	37p
QB05F	AC142	33p■
QB06G	AC176	26p■
QB07H	AC187	26p■
QB08J	AC188	37p
QB10L	ACY19	77p
QB11M	ACY20	75p
QB12N	ACY21	DIS
BL30H	AD140	£1.19
BL31J	AD149	£1.35
BL32K	AD161	61p
BL33L	AD161/2MP	£1.22
BL34M	AD162	61p

1981 Catalogue Page No.		VAT inclusive PRICE
QQ20A	ADC0804LCN	£4.45
QB19V	AF139	65p
QB20W	AF239	68p
BR45Y	AS314	33p
QB21X	AY-1-0212	£7.89■
HQ52G	AY-1-1320	£4.99
HQ51F	AY-1-5050	£1.99
YY98G	AY-3-1270	£8.30
YY89W	AY-3-1350	£7.85
WQ17T	AY-3-8115	£9.95
WQ18U	AY-5-1013A	£5.98
QB24B	AY-5-1224	£3.30
QB25C	AY-5-1230	£5.27
WQ19V	AY-5-2376	£9.95
QB26D	AY-5-4007D	£6.90
QB27E	BA102B	29p■
QQ12N	BA243	10p
QQ13P	BAR28	15p
QB28F	BAX13	7p
QB29G	BAX16	7p
QB30H	BB110G	DIS
QB31J	BC107B	14p
QB32K	BC108C	14p
QB33L	BC109C	16p
QB34M	BC117	24p
QB35Q	BC119	39p
QB36P	BC139	40p
QB37S	BC140	34p■
QB38R	BC141	37p
QB39N	BC142	34p
QB40T	BC143	34p
QB44X	BC154	27p
QB48C	BC160	43p
QB49D	BC161	36p
QB50E	BC168C	11p■
QB51F	BC169C	11p■
QB52G	BC177	20p
QB53H	BC178	20p
QB54J	BC179	20p
QB55K	BC182L	11p■
QB56L	BC183L	11p
QB57M	BC184L	11p
QB58N	BC204	15p
QB59P	BC209C	14p
QB60Q	BC212L	10p■
QB61R	BC213L	11p
QB62S	BC214L	10p
QB63T	BC301/5	40p
QB64U	BC301/5/302/5MP	89p
QB65V	BC302/5	36p
QB66W	BC327	15p
QB67X	BC328	15p
QB68Y	BC337	15p
QB69A	BC338	15p
QB70M	BC441	38p
QB71N	BC441/461MP	86p
QB72P	BC461	43p
QQ14Q	BC547	11p■
QB73Q	BC548	14p
QQ15R	BC549	11p■
QQ16S	BC557	11p■
QQ17T	BC558	11p
QQ18U	BC559	11p
QB74R	BC650	29p
QF00A	BCY70	18p
QF01B	BCY71	18p
QF03D	BD131	49p
QF04E	BD131/2MP	£1.19
QF05F	BD132	50p■
QF06G	BD135	45p
QF75S	BD136	40p
QF07H	BD139	40p■
QF08J	BD140	40p■
WH15R	BD711	68p
WH16S	BD712	68p
QF09K	BF115	38p■
QF10L	BF167	38p■
QF11M	BF180	45p
QF15R	BF200	32p
QF16S	BF244	30p■
QF17T	BF258	33p■
QF18U	BF259	39p
QF19V	BF337	40p
QQ19V	BF494	25p
QQ20W	BF495	25p
QF20W	BFW10	£1.43
QF21X	BFX29	33p
QF22Y	BFX30	35p
QF23A	BFX84	34p
QF24B	BFX85	31p
QF25C	BFX87	32p
QF26D	BFX88	36p
QF27E	BFY50	30p
QF28F	BFY51	29p
QF29G	BFY52	31p
QF30H	BPX25	£1.98
QF31J	BRY39	42p■
QF32K	BSX20	26p■
QF33L	BSX21	29p
QF34M	BSY95A	26p
QF35Q	BT109	£1.49■
QF37S	BU205	£1.90
QF38R	BU206	DIS
QF39N	BU208	£2.99
QF41U	BY126	21p
QF42V	BY127	13p■
QF43W	BY164	76p
QF44X	BY206	30p
QF45Y	BZX61C4V7	17p■
QF46A	BZX61C5V1	17p■
QF47B	BZX61C5V6	17p■
QF48C	BZX61C6V2	17p■
QF49D	BZX61C6V8	17p■
QF50E	BZX61C7V5	17p■
QF51F	BZX61C8V2	17p
QF52G	BZX61C9V1	17p■
QF53H	BZX61C10	17p■
QF54J	BZX61C11	17p■
QF55K	BZX61C12	17p■
QF56L	BZX61C13	17p■
QF57M	BZX61C15	17p■
QF58N	BZX61C16	17p■
QF59P	BZX61C18	17p■
QF60Q	BZX61C20	17p■
QF61R	BZX61C22	17p■
QF62S	BZX61C24	17p■
QF63T	BZX61C27	17p■
QF64U	BZX61C30	17p■
QF65V	BZX61C33	17p■
QF66W	BZX61C36	17p■
QF67X	BZX61C39	17p■
QF68Y	BZX61C43	17p■
QF69A	BZX61C47	17p■
QF70M	BZX61C51	17p■
QF71N	BZX61C56	17p■
QF72P	BZX61C62	17p■
QF73Q	BZX61C68	17p■
QF74R	BZX61C75	17p■

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QH00A	BZY88C2V7	9p
QH01B	BZY88C3V0	9p
QH02C	BZY88C3V3	9p
QH03D	BZY88C3V6	9p
QH04E	BZY88C3V9	9p
QH05F	BZY88C4V3	9p
QH06G	BZY88C4V7	9p
QH07H	BZY88C5V1	9p
QH08J	BZY88C5V6	9p
QH09K	BZY88C6V2	9p
QH10L	BZY88C6V8	9p
QH11M	BZY88C7V5	8p
QH12N	BZY88C8V2	9p
QH13P	BZY88C9V1	9p
QH14Q	BZY88C10	9p
QH15R	BZY88C11	9p
QH16S	BZY88C12	9p
QH17T	BZY88C13	9p
QH18U	BZY88C15	9p
QH19V	BZY88C16	9p
QH20W	BZY88C18	9p
QH21X	BZY88C20	9p
QH22Y	BZY88C22	9p
QH23A	BZY88C24	9p
QH24B	BZY88C27	9p
QH25C	BZY88C30	9p
QH26D	CA3046	99p
YH58N	CA3080E	£1.25
QH27E	CA3089E	£2.70■
QH28F	CA3130T	£1.25
QH29G	CA3140T	99p■
WQ20W	CA3189E	£1.95
WQ21X	CA3240E	£1.38
YG37S	CL8960	£29.95
QH30H	C106D	42p■
WQ22Y	C116D	99p
WQ23A	C126D	£1.63
WQ24B	C206D	£1.27
WQ25C	C226D	85p■
QL14Q	C246D	£1.24
QQ01B	DAC0801LCN	£2.45
YY82D	DF412	£6.45
QQ21X	DV1202W	£8.35
QQ22Y	DV1205W	£10.70
QQ23A	DV1210W	£13.63
QQ24B	DV1220W	£16.88
QQ25C	DV1230W	£21.30
QQ26D	DV1240W	£25.50
WQ26D	ER1400	£9.99
WQ27E	ER3401	£19.58
WQ28F	HSCH1001	55p
YH59P	ICL7109	£16.55
YY75S	ICL7660CPA	£2.75
YY93B	ICM7045IPI	£14.95
YY94C	ICM7216DIPI	£17.45■
YY95D	ICM7226BIPI	£21.90
YH63T	ICM 7555	£1.25
QH32K	IR122A	DIS
QH33L	1R122D	£3.95
BH45Y	J005	£1.75■
BL36P	J02	£1.80■
BH46A	J04	£1.95■
BH47B	K01	£3.15
BH48C	K04	£4.25
*YY74R	L200	£2.69
WQ29G	LF347	£2.55
WQ30H	LF351	56p
WQ31J	LF353	99p
YY69A	LF13741	55p
QH35Q	LH0042C	£4.95
QH36P	LM301A	27p■
QH37S	LM308	95p
WQ32K	LM334	£1.10
YY73Q	LM335Z	£1.23
QH38R	LM377	£1.77■
QH39N	LM379S	£5.29
QH40T	LM380	75p■
QH41U	LM381	£1.90
YY84F	LM382	£1.43
WQ33L	LM383	£1.61
WQ34M	LM384	£1.44
WQ35Q	LM387	£1.25
WQ36P	LM389	£1.09■
YY85G	LM1818	£1.95
YY99H	LM1830	£2.65
YY71N	LM1871	£5.20
YY72P	LM1872	£5.20
WQ38R	LM2917	£2.29■
WQ37S	LM1820	£1.80
QH42V	LM3900	57p■
WQ39N	LM3909	97p
*WQ40T	LM3911	£1.31■
WQ41U	LM3914	£2.41■
YY96E	LM3915	£2.53
YY97F	LM3916	£3.46
YH64U	LM13600N	£1.39
YY81C	M083	£4.75
WH22Y	M087	£4.95
YY90X	M108	£18.25
YY91Y	M147	£6.51■
HQ71N	M251	£12.20
†QH64U	M252	£8.95
WH21X	M254	£7.49
XL07H	MA1003	DIS
XL14Q	MA1023	DIS
QH43W	MCR102	59p
QH44X	MC1303	DIS
QH45Y	MC1310P	£2.30
QH47B	MC1496	89p■
QH48C	MC3302P	80p
QH49D	MC3340P	£1.27

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QH50E	MC3360P	DIS
WQ42V	MCM4027 250ns	£1.88
WQ43W	MC6800P	£4.31■
WQ44X	MC6802P	£5.99■
WQ45Y	MC6810AP 450ns	£1.98■
WQ46A	MC6821P	£1.99■
QQ03D	MC6845	£11.21■
WQ48C	MC6850P	£2.99■
WQ49D	MC6852P	£2.95■
WQ50E	MC6875L	£6.32■
HQ61R	MEL 12	38½p
QH54J	MJE340	75p■
WQ51F	MJE350	£1.15
*QH55K	MJE2955=TIP2955	99p
*QH56L	MJE3055=TIP3055	88p
QH57M	MJ2501	£3.20
BL38R	MJ2955	99p
QH58N	MJ3001	£2.40
YY92A	MK50395	£8.30
YH67X	ML922	£5.25■
YH68Y	ML928	£2.40
YH69A	ML929	£2.40
QH59P	MPF102	66p
QH60Q	MPSA14	34p

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QH61R	MPSA65	45p
QH62S	MPS3638	16p
QH63T	MPS3638A	18p
BL23A	MS4A	£2.95
WQ53H	MVAM115	£1.85
WQ54J	NE531	£1.65
WQ55K	NE 544	£2.18
QH66W	NE 555	21p■
QH67X	NE 556	62p■
WQ56L	NE 565	£1.34
QH68Y	NE 566	£1.93■
QH69A	NE 567	£1.60
*YY87U	NE571	£4.77
YY68Y	NE5534A	£2.45■
YY67X	NE5539	£7.85
YG38R	NSM4000A	£9.85
QH70M	OA47	12p■
QH71N	OA90	9p
QH72P	OA91	8p■
QH73Q	OA95	8p■
QH74R	OA200	8p
QH75S	OA202	13p
QH77J	OC28	DIS
QH78K	OC35	£1.35
QH82D	OC45	47p
QH83E	OC70	38p■
QH84F	OC71	31p
QH85G	OC72	42p■
QH87U	OC81	42p■
QH89W	OC83	45p
QH91Y	OC170	95p
QH92A	OC171	99p
QH93B	PN3643	30p
WQ57M	PW01	95p
WQ58N	PW06	99p
WQ59P	RO-3-2513	£8.95
QL00A	R2008B	£2.25
QL02C	SAM77	£1.20
QL05F	SC146D	£1.45
WQ60Q	SFF96364	£9.45■
QL06G	SG1495D	£3.95
QL07H	SG3402	£3.78
WQ61R	SH120A	£6.65
YH66W	SL490	£3.35
QL08J	ST2	25p
QL09K	S005	47p
QL10L	S04	52p
WQ62S	TAA 550	35p■
QL11M	TAG1/100	£1.45
QL12N	TAG1/600	£1.20
BL35Q	TBA 651	£2.25
QL13P	TBA810P	95p
WQ63T	TBA820M	70p
YY79L	TCA350Z	£3.95
WQ64U	TCA4500A	£3.35
*WH20W	TDA1022	£6.75■
YY76H	TDA1024	£1.49
YY70M	TDA2005M	£8.25
WQ66W	TDA2006	£1.65
WQ67X	TDA2030	£1.95
*YY86T	TDA3410	£1.90
QL15R	TIP31A	39p■
QL16S	TIP32A	39p
WQ71N	TIP33A	78p■
WQ72P	TIP34A	99p
QL17T	TIP41A	45p
QL18U	TIP42A	45p
WQ73Q	TIP122	65p
WQ74R	TIP127	75p
QL19V	TIS43	55p
WQ75S	TL170C	49p
WQ76H	TL172C	76p
YY77J	TL430C	85p
YY78K	TL497A	£1.65
YY88V	TMS1121	£8.95
QL20W	uA709C	75p
BL22Y	uA723C TO99	85p
QL21X	uA723C 14-pin DIL	55p
QL22Y	uA741C 8-pin DIL	23p
QL23A	uA741C 14-pin DIL	78p
QL24B	uA747C	75p■
QL25C	uA748C	52p
QL26D	uA78L05AWC	45p
WQ77J	uA78L12AWC	45p
QL27E	uA78L15AWC	45p
QL28F	uA78M05UC	79p
QL29G	uA78M12UC	79p
QL30H	uA78M15UC	79p
WQ78K	u78MGU1C	£1.25
QL31J	uA7805UC	78p
QL32K	uA7812UC	78p
QL33L	uA7815UC	78p
WQ79L	uA78GU1C	£1.25
QL34M	uA7805KC	£1.65
QL35Q	uA7815KC	£1.65
WQ80B	uA78H05KC	£6.49
WQ81C	uA78H12KC	£6.49
WQ82D	uA78H15KC	DIS
WQ83E	uA78HGKC	£6.25
WQ84F	uA78P05SC	£8.25
WQ85G	uA79L05AWC	58p
WQ86T	uA79L12AWC	63p
WQ87U	uA79L15AWC	75p
WQ88V	uSA79M05UC	89p
WQ89W	uA79M12UC	89p
WQ90X	uA79M15UC	89p
WQ91Y	uA79MGU1C	£1.20
WQ92A	uA7905UC	£1.38
WQ93B	uA7912UC	95p
†QL36P	uA7915UC	95p
WQ94C	uA79GU1C	£1.25
WQ95D	uA79HGKC	£8.59
QQ27E	VK10KM	99p
QQ28F	VK1010	£1.35
QQ29G	VK1011	£1.35
WQ96E	VN46AF	£1.27
WQ97F	VN66AF	£1.55
WQ98G	VN88AF	£1.37
QQ11M	VQ1000CJ	£4.90
QL37S	W005	33p
QL38R	W01	34p
QL39N	W02	38p
QL40T	W04	39p
QL41U	ZN414	£1.25
QL42V	ZS120	44p
QL43W	ZTX107	15p
QL44X	ZTX108	15p
QL45Y	ZTX109	19p
QL46A	ZTX300	16p
QL47B	ZTX301	20p
QL48C	ZTX302	22½p
QL50E	ZTX304	24p
QL54J	ZTX326	£1.10
QL56L	ZTX330	26p
QL57M	ZTX331	28p
QL60Q	ZTX500	21p
QL62S	ZTX502	19p
QL64U	ZTX504	27p

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QL66W	ZTX530	29p
QL67X	ZTX531	33p
QL68Y	ZTX541	31p
QL69A	ZTX542	33p
QL70M	Z5J	£2.75
QW00A	Z80-CPU	£7.95
QW01B	Z80-CTC	£4.50
QW03D	Z80-PIO	£4.25
QW04E	Z80-SIO	£19.00
QL71N	1N914	4p
QL72P	1N916	5p
QL73Q	1N4001	5p
QL74R	1N4002	5p
QL75S	1N4003	6p
QL76H	1N4004	6p
QL77J	1N4005	6p■
QL78K	1N4006	6p■
QL79L	1N4007	7p
QL80B	1N4148	4p
QL81C	1N5400	14p
QL82D	1N5401	16p
QL83E	1N5402	16p■
QL84F	1N5404	19p
QL85G	1N5406	20p
QL86T	1N5407	21p
QL87U	1N5408	19p■
QL88V	1S921	9p
QH46A	1458C	45p■
QW05F	1702 1000ns	£4.10■
QR00A	2N697	39p
QR01B	2N706	26p
QR03D	2N708	35p
QR04E	2N1302	DIS
QR05F	2N1303	DIS
QR06G	2N1304	DIS
QR09K	2N1711	39p
QR10L	2N1893	32p■
QR11M	2N2219	31p
QR12N	2N2369A	22p■
QR13P	2N2484	28p
QR14Q	2N2646	55p
QR15R	2N2647	95p
QR16S	2N2904	31p
QR17T	2N2905	31p
QR18U	2N2906	26p
QR19V	2N2907	26p
QR20W	2N2926Or	12p
QR21X	2N2926Ye	12p
QR22Y	2N2926Gn	12p
QR23A	2N3053	34p
QR24B	2N3054	66p■
BL45Y	2N3055	75p
QR25C	2N3525	£1.85
QR26D	2N3702	13p
QR27E	2N3703	10p
QR28F	2N3704	10p■
QR29G	2N3705	12p
QR30H	2N3706	14p
QR31J	2N3707	12p
QR32K	2N3708	11p■
QR34M	2N3711	11p■
QW07H	2N3772	£1.95
QR35Q	2N3773	£2.94
QR36P	2N3819	32p
QR37S	2N3823	65p■
QR38R	2N3866	£1.36
QR39N	2N3903	17p
QR40T	2N3904	17p
QR41U	2N3905	15p
QR42V	2N3906	14p■
QR43W	2N4058	12p
QR44X	2N4060	12p
QR45Y	2N4061	17½p
QR46A	2N4062	12p
QR47B	2N4871	69p
QR49D	2N5458	36p■
QR50E	2N5459	29p■
QR51F	2N6073	£1.20
QW08J	2N6609	£4.50
QQ30H	2SA872	30p
QQ31J	2SB716	30p
QQ32K	2SC1307	NYA
QQ33L	2SD756	30p
QQ34M	2SJ48	£2.50
QQ35Q	2SJ49	£2.90
QW09K	2SJ50	£4.54
QQ36P	2SK133	£2.50
QQ37S	2SK134	£2.90
QW10L	2SK135	£4.30
QW11M	2102 450ns	£2.30
QW12N	2114 450ns	£1.30■
QW13P	2708 450ns	£2.75
QQ07H	2716 450ns	£3.23■
QQ08J	2732 450ns	£15.65
QQ09K	2764 450ns	NYA
QR52G	3N140	£1.12
QR53H	3N141	DIS
QH51F	3403	88p
QX00A	4000BE	24p
QX01B	4001BE	17p■
QL03D	4001UBE	17p■
QX02C	4002BE	16p■
QX03D	4006BE	68p■
QX04E	4007UBE	18p■
QW14Q	4008BE	62p■
QX05F	4011BE	16p■
QL04E	4011UBE	24p■
QX06G	4012BE	18p■
QX07H	4013BE	35p
QW15R	4014BE	89p
QW16S	4015BE	66p■
QX08J	4016BE	32p■
QX09K	4017BE	48p■
QX10L	4018BE	68p■
QW17T	4019BE	42p
QX11M	4020BE	61p■
QW18U	4021BE	49p
QW19V	4022BE	66p■
QX12N	4023BE	23p
QX13P	4024BE	45p■
QX14Q	4025BE	22p■
QX15R	4026BE	£1.20
QX16S	4027BE	38p■
QX17T	4028BE	58p■
QW20W	4029BE	77p■
QW21X	4031BE	£1.70
QW22Y	4032BE	75p
QW23A	4033BE	95p
QW24B	4034BE	£1.95
QW25C	4035BE	60p
QW26D	4038BE	85p
QW27E	4040BE	59p■
QW28F	4041UBE	83p
QX19V	4042BE	60p■
QW29G	4043BE	70p
QW30H	4044BE	65p■
QW31J	4045BE	£1.40
QW32K	4046BE	75p

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QX20W	4047BE	75p
QW33L	4048BE	60p
QX21X	4049UBE	30p■
QX22Y	4050BE	30p■
QW34M	4051BE	78p■
QW35Q	4052BE	78p
QW36P	4053BE	78p
QW37S	4054BE	95p
QW38R	4055BE	85p

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QW39N	4056BE	£1.12
QW40T	4060BE	£1.20
QW41U	4063BE	85p
QX23A	4066BE	36p■
QW42V	4067BE	£3.69
QX24B	4068BE	23p
QX25C	4069UBE	20p■
QX26D	4070BE	26p
QW43W	4071BE	21p
QX27E	4072BE	21p■
QW44X	4073BE	21p■
QW45Y	4075BE	21p■
QW46A	4076BE	60p■
QW47B	4077BE	26p
QX28F	4078BE	26p■
QW48C	4081BE	24p■
QW49D	4082BE	21p■
QW50E	4085BE	65p
QW51F	4086BE	65p
QW52G	4089BE	£1.40
QW53H	4093BE	43p■
QW54J	4094BE	£1.20
QW55K	4095BE	75p
QW56L	4097BE	£3.20
QX29G	4098BE	85p
QW57M	4099BE	95p■
QW58N	40100BE	£1.49
QW59P	40101BE	90p
QW60Q	40102BE	£1.50
QW61R	40103BE	85p
QW62S	40104BE	85p
QW63T	40105BE	85p
QW64U	40106BE	75p
QW65V	40107BE	60p■
QW66W	40108BE	£4.30
QW67X	40109BE	95p
QW68Y	40110BE	£1.10
QW69A	40160BE	£1.25
QW70M	40161BE	£1.20
QW71N	40162BE	85p
QW72P	40163BE	85p
QW73Q	40174BE	85p
QQ38R	40175	95p■
QW74R	40181BE	£1.99
QW75S	40182BE	85p
QW76H	40192BE	£1.25
QW77J	40193BE	80p
QW78K	40194BE	85p
QW79L	40257BE	£1.10
QX34M	40673	£1.75
QW93B	4116 250ns	£1.30■
QQ05F	4118 250ns	£4.45■
QQ06G	4164 250ns	£9.20
XX01B	4136	75p■
QW80B	4151	89p
XX02C	4195	£1.45
QQ39N	4412VP	£8.00■
QX30H	4416BE	£1.92
QQ40T	4459	£8.00■
QW81C	4502BE	£1.19
QQ41U	4503	95p
QW82D	4508BE	£2.10
QW83E	4510BE	68p
QX31J	4511BE	68p■
QW84F	4512BE	£1.49
QW85G	4514BE	£1.55
QW86T	4515BE	£1.55
QW87U	4516BE	60p■
QX32K	4518BE	63p■
QX33L	4520BE	78p
QQ42V	4521	£2.00
QQ43W	4522	£1.25■
QQ44X	4526	95p■
QW88V	4527BE	£1.15
QX29G	4528BE see 4098BE	
QQ45Y	4529	£1.42
QQ46A	4530	97p
QW89W	4532BE	£1.10■
QQ47B	4541	£1.40
QQ48C	4551	£1.59
QW90X	4555BE	50p■
QW91Y	4556BE	58p
QQ49D	4568	£3.15
QQ50E	4583	£1.79
QQ51F	45100	£2.90
QX35Q	5W Zener 5V6	£1.27
QX36P	5W Zener 8V2	£1.27
YH31J	5101-L1	£3.48■
QQ04E	6402	£5.80
QQ02C	6502	£5.48■
QX37S	7400	19p
YF00A	74LS00	21p
QX38R	7401	21p
YF01B	74LS01	21p
QX39N	7402	23p
YF02C	74LS02	23p
QX74R	7403	25p
YF03D	74LS03	23p
QX40T	7404	21p
YF04E	74LS04	22p
QX41U	7405	22p
YF05F	74LS05	22p
QX75S	7406	24p
QX76H	7407	25p
QX42V	7408	31p
YF06G	74LS08	22p
QX77J	7409	34p
YF07H	74LS09	75p
QX43W	7410	25p
YF08J	74LS10	22p
QX44X	7411	24p
YF09K	74LS11	22p■
YF10L	74LS12	24p
QX45Y	7413	43p
YF11M	74LS13	47p■
QX46A	7414	57p
YF12N	74LS14	44p
YF13P	74LS15	24p
QX78K	7416	31p
QX79L	7417	26p
QX47B	7420	28p
YF14Q	74LS20	24p
QX48C	7421	86p
YF15R	74LS21	26p
YF16S	74LS22	26p
QX80B	7425	28p
QX81C	7426	22p

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YF17T	74LS26	29p
QX49D	7427	29p
YF18U	74LS27	29p■
YF19V	74LS28	44p
QX50E	7430	24p
YF20W	74LS30	22p
QX51F	7432	36p
YF21X	74LS32	22p
YF22Y	74LS33	40p
YF23A	74LS37	26p
QX82D	7438	26p
YF24B	74LS38	48p
QX53H	7440	24p
YF25C	74LS40	44p
QX54J	7442	66p
YF26D	74LS42	26p■
QX55K	7447A	85p
QQ52G	74LS47	80p
QQ53H	74LS48	80p
QX83E	7451	30p
YF27E	74LS51	35p
QX84F	7454	30p
YF28F	74LS54	40p
YF29G	74LS55	40p
QX56L	7470	36p
QX57M	7472	39p
QX58N	7473	32p
YF30H	74LS73	36p
QX59P	7474	32p
YY83E	74ALS74	£3.35
YF31J	74LS74	32p
QX60Q	7475	71p
YF32K	74LS75	38p
QX61R	7476	32p
YF33L	74LS76	36p
YF34M	74LS78	39p
QX62S	7481	£1.75
QX85G	7483	58p
QX63T	7485	77p
YF35Q	74LS85	74p
QX64U	7486	31p
YF36P	74LS86	33p
QX65V	7489	£3.10■
QX66W	7490	35p■
YF38R	74LS90	44p
QX86T	7491	£1.20
QX67X	7492	42p
YF39N	74LS92	59p
QX68Y	7493	79p
YF40T	74LS93	42p
QX69A	7494	39p
QX70M	7495	54p■
YF41U	74LS95	£1.20
QX87U	7496	52p
YF42V	74LS96	£1.69
QX71N	74107	26p■
YF43W	74LS107	36p
QX88V	74109	96p
YF44X	74LS109	36p
YF45Y	74LS112	36p
YF46A	74LS113	40p
YF47B	74LS114	50p
QX72P	74118	£2.30
QX73Q	74121	55p
WH00A	74122	76p
QQ54J	74LS122	66p
WH01B	74123	42p
YF48C	74LS123	68p
WH02C	74LS124	£2.15
YF49D	74LS125	45p
YF50E	74LS126	45p
WH03D	74132	76p
YF51F	74LS132	49p■
YF52G	74LS136	57p
QQ55K	74LS137	£2.20
YF53H	74LS138	49p
YF54J	74LS139	47p■
WH05E	74141	65p■
WH06G	74145	67p
YF55K	74LS145	£1.65
QX89W	74150	75p
WH07H	74151	65p
YF56L	74LS151	50p
YF57M	74LS153	52p
WH08J	74154	£1.15
YF58N	74LS154	98p
YF59P	74LS155	55p
YF60Q	74LS156	57p
YF61R	74LS157	42p
YF62S	74LS158	50p
WH09K	74160	72p
YF63T	74LS160	72p
YF64U	74LS161	95p
YF65V	74LS162	£1.40
YF66W	74LS163	60p
WH10L	74164	90p
YF67X	74LS164	70p■
YF68Y	74LS165	£1.40
YF69A	74LS166	£1.95
YF70M	74LS168	£1.20
YF71N	74LS169	99p
YF72P	74LS170	£2.99
YF73Q	74LS173	65p
WH11M	74174	99p
YF74R	74LS174	55p■
YF75S	74LS175	55p
YF76H	74LS181	£2.95
YF77J	74LS189	£4.95
YF78K	74LS190	75p
YF79L	74LS191	75p■
WH12N	74192	95p
YF80B	74LS192	£1.65
QX90X	74193	£1.95
YF81C	74LS193	70p
WH13P	74194	95p
YF82D	74LS194	85p
YF83E	74LS195	£1.30
WH14Q	74196	95p
YF84F	74LS196	£2.35
YF85G	74LS197	£1.65
YF86T	74LS221	63p
YF87U	74LS240	99p
YF88V	74LS241	99p
YF89W	74LS242	£1.75
YF90X	74LS243	£2.55
QQ56L	74LS244	£1.15
YF91Y	74LS245	£1.95
YF92A	74LS251	75p
YF93B	74LS253	£1.65
YF94C	74LS256	£1.36
YF95D	74LS257	55p
YF96E	74LS258	55p
YF97F	74LS259	£2.15
YF98G	74LS261	£2.25■
YF99H	74LS266	32p
YH00A	74LS273	£1.50
YH01B	74LS279	44p
YH02C	74LS283	69p
YH03D	74LS290	£1.30
YH04E	74LS293	96p
YH05F	74LS295	£2.35
YH06G	74LS298	£1.75
YH07H	74LS299	£4.25
YH08J	74LS323	£6.75
YH09K	74LS363	£3.25
YH10L	74LS364	NYA
YH11M	74LS365	39p
YH12N	74LS366	72p
YH13P	74LS367	69p
YH14Q	74LS368	43p
YH15R	74LS373	£1.15
YH16S	74LS374	£1.30
YH17T	74LS375	£1.30
YH18U	74LS377	£2.90
YH19V	74LS378	£1.40
YH20W	74LS379	£2.40
YH21X	74LS390	£1.45
YH22Y	74LS393	£1.40
YH23A	74LS395	£1.35
YH24B	74LS398	£1.99
YH25C	74LS399	£2.50
QQ57M	74LS442	£3.50
QQ58N	74LS443	£6.85
YH26D	74LS490	£2.40
YH27E	74LS568	NYA
YH28F	74LS569	NYA
QQ59P	74LS600	NYA
QQ60Q	74LS606	£23.60
QQ61R	74LS608	NYA
QQ62S	74LS610	NYA
YH29G	74LS670	£1.46
QQ63T	74LS684	£4.75
YH30H	74C917	£8.85
YH32K	76477	£2.90
YH33L	76489	£4.75
YH34M	8T28	£3.30
YH35Q	8T95	£2.55
YH36P	8T97=74LS367	63p
YH37S	8T98	£2.35
YH38R	8038 CCPD	£4.69
YH39N	8069 DCQ	£2.35
YH40T	8080A	£4.95
YH41U	8085A	£5.99
YH43W	8211 CPA	£3.25
YH44X	8212	£1.95■
YH45Y	8216	£1.95■
YH46A	8224	£2.68■
YH47B	8228	£4.45■
YH48C	8250	£9.95
YH49D	8251	£4.60■
YH50E	8255A	£4.40■
YH51F	8279	£9.95
YH52G	82S126M1	£3.49

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QH36P	LM301A	27p■
QH37S	LM308	95p

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WQ54J	NE531	£1.65
YY68Y	NE5534A	£2.45■
QL20W	uA709C	75p
QL22Y	uA741C 8-pin DIL	23p
QL23A	uA741C 14-pin DIL	78p
QL24B	uA747C	75p■
QL25C	uA748C	52p
QH46A	1458C	45p■
QH51F	3403	88p
XX01B	4136	75p■
QH28F	CA3130T	£1.25
QH29G	CA3140T	99p■
WQ21X	CA3240E	£1.38

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QH35Q	LH0042C	£4.95
WQ30H	LF351	56p
WQ31J	LF353	99p
WQ29G	LF347	£2.55
YY69A	LF13741	55p
YH58N	CA3080E	£1.25
YH64U	LM13600N	£1.39
QH48C	MC3302P	80p

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QH50E	MC3360P	DIS
WQ63T	TBA820M	70p
QH38R	LM377	£1.77■

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WQ36P	LM389	£1.09■
QH39N	LM379S	£5.29
QH40T	LM380	75p■

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WQ33L	LM383	£1.61
BY73Q	8W Amp PCB	62p
LW36P	8W Amp Kit	£4.45
WQ34M	LM384	£1.44
QL13P	TBA810P	95p
BR02C	5W Amp PCB	£1.45
YY70M	TDA2005M	£8.25

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WQ67X	TDA2030	£1.95
YQ43W	15W Amp Kit	£6.45
YQ35Q	15W Amp PCB	£1.25
YQ36P	15W Amp Bracket	65p
YQ38R	30/2 PSU PCB	£1.40
YQ37S	15W Amp Module	£6.49

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WQ66W	TDA2006	£1.65
QH44X	MC1303	DIS
QH41U	LM381	£1.90
BR04E	LM381 PCB	£2.15

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YY84F	LM382	£1.43
*YY87U	NE571	£4.77
*YY86T	TDA3410	£1.90
WQ35Q	LM387	£1.25

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QH49D	MC3340P	£1.27
YY85G	LM1818	£1.95
QB21X	AY-1-0212	£7.89■
YY81C	M083	£4.75
WH22Y	M087	£4.95

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1981 Catalogue Page No.		VAT inclusive PRICE
HQ51F	AY-1-5050	£1.99
HQ53H	Piano IC Kit	£38.44
HQ52G	AY-1-1320	£4.99
HQ71N	M251	£12.20
†QH64U	M252	£8.95
WH21X	M254	£7.49
YY90X	M108	£18.25

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YY91Y	M147	£6.51■
YY89W	AY-3-1350	£7.85
*WH20W	TDA1022	£6.75■
YH33L	76489	£4.75

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YY79L	TCA350Z	£3.95
YH32K	76477	£2.90
YQ42V	Sound Effects PCB	£1.10

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WQ61R	SH120A	£6.65
QH27E	CA3089E	£2.70■
WQ20W	CA3189E	£1.95

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WQ37S	LM1820	£1.80
BL35Q	TBA 651	£2.25
WQ64U	TCA4500A	£3.35
QH45Y	MC1310P	£2.30
BR03D	Decoder PCB	£1.72

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WQ17T	AY-3-8115	£9.95
QL41U	ZN414	£1.25

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QH47B	MC1496	89p■
QL06G	SG1495D	£3.95
QL07H	SG3402	£3.78
QH26D	CA3046	99p

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YH66W	SL490	£3.35
YH67X	ML922	£5.25■

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YH68Y	ML928	£2.40
YH69A	ML929	£2.40
YY71N	LM1871	£5.20
YQ69A	LM1871 Xmitter PCB	98p

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YY72P	LM1872	£5.20
YQ70M	LM1872 Receiver PCB	95p
WQ55K	NE 544	£2.18
YQ71N	Servo Driver PCB	85p
WQ76H	TLI72C	76p

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WQ75S	TL170C	49p
YG37S	CL8960	£29.95
YY99H	LM1830	£2.65
YY73Q	LM335Z	£1.23
*WQ40T	LM3911	£1.31■

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YY98G	AY-3-1270	£8.30
WQ41U	LM3914	£2.41■
YY96E	LM3915	£2.53
YY97F	LM3916	£3.46
YQ66W	LM3914 PCB	85p

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YH30H	74C917	£8.85
YY82D	DF412	£6.45
QB24B	AY-5-1224	£3.30
BB53H	4-Dig Clock PCB 'A'	£1.10

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FY90X	Crystal 6.5536MHz	£2.98
YY93B	ICM7045IPI	£14.95
QB25C	AY-5-1230	£5.27

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YY88V	TMS1121	£8.95
YY92A	MK50395	£8.30
QB26D	AY-5-4007D	£6.90

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YY94C	ICM7216DIPI	£17.45■
YY95D	ICM7226BIPI	£21.90
YH63T	ICM 7555	£1.25

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QH66W	NE 555	21p■
QH67X	NE 556	62p■
QH68Y	NE 566	£1.93■
WQ56L	NE 565	£1.34

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QH69A	NE 567	£1.60
WQ39N	LM3909	97p
YY76H	TDA1024	£1.49
YH43W	8211 CPA	£3.25
WQ32K	LM334	£1.10
YH39N	8069 DCQ	£2.35
WQ62S	TAA 550	35p■

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YY78K	TL497A	£1.65
YY77J	TL430C	85p
YY75S	ICL7660CPA	£2.75
XX02C	4195	£1.45
XX04E	15V Supply PCB	75p
BL22Y	uA723C TO99	85p
QL21X	uA723C 14-pin DIL	55p

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YQ39N	0.1A Reg PSU PCB	£1.05
YQ40T	0.5/1A Reg V PS PCB	85p
YQ41U	0.5/1A Reg -V PS PCB	85p
YQ54J	0.5/1A Vareg Pos PCB	85p
YQ55K	0.5/1A Vareg Neg PCB	85p
*YY74R	L200	£2.69

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QQ02C	6502	£5.48■
WQ43W	MC6800P	£4.31■
WQ44X	MC6802P	£5.99■
WQ46A	MC6821P	£1.99■
WQ48C	MC6850P	£2.99■
WQ49D	MC6852P	£2.95■
WQ50E	MC6875L	£6.32■
QW00A	Z80-CPU	£7.95
QW03D	Z80-PIO	£4.25
QW04E	Z80-SIO	£19.00
QW01B	Z80-CTC	£4.50

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YH40T	8080A	£4.95
YH41U	8085A	£5.99
YH46A	8224	£2.68■
YH47B	8228	£4.45■
YH50E	8255A	£4.40■
YH49D	8251	£4.60■
YH48C	8250	£9.95
YH51F	8279	£9.95
YH44X	8212	£1.95■
YH45Y	8216	£1.95■
YH34M	8T28	£3.30
YH35Q	8T95	£2.55
YH36P	8T97=74LS367	63p
YH37S	8T98	£2.35
WQ19V	AY-5-2376	£9.95

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WQ18U	AY-5-1013A	£5.98
QQ04E	6402	£5.80
WQ60Q	SFF96364	£9.45■
QQ03D	MC6845	£11.21■
YH31J	5101-L1	£3.48■
QW11M	2102 450ns	£2.30
WQ45Y	MC6810AP 450ns	£1.98■
QW12N	2114 450ns	£1.30■
QQ05F	4118 250ns	£4.45■
WQ42V	MCM4027 250ns	£1.88

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QW93B	4116 250ns	£1.30■
QQ06G	4164 250ns	£9.20
QW05F	1702 1000ns	£4.10■
QW13P	2708 450ns	£2.75
QQ07H	2716 450ns	£3.23■

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QQ08J	2732 450ns	£15.65
QQ09K	2764 450ns	NYA
XY84F	Softy	£142.50
XY85G	Softy PSU	£24.95
XY83E	EPROM Eraser	£42.95

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WQ26D	ER1400	£9.99
WQ27E	ER3401	£19.58
YH52G	82S126M1	£3.49
WQ59P	RO-3-2513	£8.95
YH38R	8038 CCPD	£4.69

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YQ65V	8038 PCB	85p
QW80B	4151	89p
QQ01B	DAC0801LCN	£2.45
QQ00A	ADC0804LCN	£4.45
YH59P	ICL7109	£16.55
WQ38R	LM2917	£2.29■

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YQ67X	LM2917 PCB	85p
QW94C	7106	£8.95
QW95D	7107	£8.45
BY76H	7106/7 PCB	£1.45
WR29G	Transkt 3-Lead TO18	16p
WR30H	Transkt 4-Lead TO18	31p
WR31J	Transkt 3-Lead TO5	19p
WR32K	IC Skt 8-Lead	52p
WR33L	IC Skt 10-Lead	67p

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WR24B	Kit TO3	8p
WR25C	Kit TO66	9p
WR27E	Kit SO55	9p
WR26D	Kit TO126	5p
WR23A	Kit (P) Plas	6p
BL17T	DIL Socket 8-pin	9p
BL18U	DIL Socket 14-Pin	11p■
BL19V	DIL Socket 16-pin	12p■
HQ76H	DIL Socket 18-pin	16p
HQ77J	DIL Socket 20-pin	17p
HQ78K	DIL Socket 22-pin	20p
BL20W	DIL Socket 24-pin	19p■
BL21X	DIL Socket 28-pin	24p
HQ38R	DIL Socket 40-pin	31p■
YX50E	ZIF Socket 24-Way	£3.40
XX14Q	Soldercons	90p
YG27E	Header 14-pin	54p
YG28F	Header 16-pin	63p
YG29G	Header 24-pin	£1.10
FR25C	Insertion Tool	80p

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FL56L	Transistor Cover	10p
HQ79L	Heatsink 92F	14p
HQ80B	Heatsink 18F	19p
FL78K	Heatsink Clip-On	16p
WR34M	TO5 Chassis Heatsink	89p
FL59P	Vaned Heatsink TO3	46p
FL58N	Vaned Htsnk Plas Pwr	34p
FL57M	Vaned Heatsink IC	72p
HQ70M	Heatsink 2E	£2.55
FL41U	Heatsink 4Y	£1.70
HQ69A	50W Hi-Fi Heatsink	£1.95

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HQ81C	8W Hi-Fi Heatsink	£1.17
FL42V	Flat Heatsink	£3.25
FL54J	Heatsink 10DN	£2.15
FL55K	Heatsink 10DNDR	£2.60
FL77J	Heatsink 6W-1	£5.50
YB26D	Heatsink 60DN	£13.95
FL79L	Thermpath	£3.60
*HQ00A	Small Thermpath	90p
WY08J	Standard Fan	£15.50

SPEAKERS

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HY12N	Ultrasonic Transducr	£6.20
FL39N	Buzzer 6V	88p
FL40T	Buzzer 12V	88p
FL38R	AC Bell	£1.90
FL37S	Bell Xformer	£4.95
FQ08J	Bell Push	£1.10
FQ09K	Nameplate Bell Push	55p
YB25C	Baby Siren	£9.25
LH96E	Plastic Siren	£5.50
LH97F	Star War Siren	£5.95

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LH98G	Hawaii Five-O Siren	£24.95
XQ71N	Re-entrant Horn Sndr	£26.50
XQ72P	Megaphone	£49.95
XY76H	Pistol Grip Megphone	£44.95
XQ73Q	Car PA 8W	£8.25
XQ74R	Car PA 15W	£12.95

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YW52G	2in Piezo Tweeter	£2.49
WF54J	Direct Rad Piezo	£4.55■
WF09K	Piezo Horn Flush	£5.25
WF55K	Piezo Horn Recessed	£5.25
WF56L	Wide Angle Piezo	£7.90■
LB23A	Mag Earpiece 2.5mm	25p
LB24B	Mag Earpiece 3.5mm	25p
LB25C	Crystal Earpiece	55p
YW57M	Stethoscope	75p
WB04E	L/S Lo-Z 388	85p■
WB05F	L/S Lo-Z 458	89p
WB08J	L/S Lo-Z 508	89p
WB09K	L/S Lo-Z 568	89p
WB13P	L/S Lo-Z 668	89p
WF57M	Hi-Z L/S 64R	99p
YW53H	L/S Lo-Z 768	99p
WF58N	3 inch Tweeter	£1.45

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YW54J	15W Cone Tweeter	£2.85
WF24B	Multi-Cell Tweeter	£5.95
WF33L	Free Stand Tweeter	£5.95
WF43W	Dome Tweeter	£5.45
WF44X	Rectangular Tweeter	£5.45
WF02C	Crossover 2-Way	£4.20
WF03D	Crossover 3-Way	£5.20

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WF45Y	Escutcheon Crssvr	£4.99
WF46A	Controlled Crossover	£10.69
WF47B	Low-Cost 4in Spkr	£1.98
WB27E	Rd Spkr CM420	£2.56
YW55K	Plastic Car Grille	90p
YW56L	Metal Car Grille	90p
WF48C	Hvy Duty Car Spkr	£6.45
WF50E	Elliptcal Spkr CM641	£3.35
WF18U	Elliptcal Spkr CM742	£4.45■
WF23A	Elliptcal Spkr CM852	£5.20
WY13P	Elliptcal Spkr LT853	£6.45

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WF00A	Rd Speaker LT530	£6.95
WF52G	Rd Speaker LT610	£5.75
WF08J	Rd Speaker CM820	£5.95
WF11M	Rd Speaker LT830	£7.30
WF12N	Rd Speaker LT840	£11.45
WF53H	20W Squawker	£3.25
WY15R	40W Squawker	£5.25
XQ77J	Fane 50 4R	£19.95
XB26D	Fane 50 8R	£21.45
XQ78K	Disco 80 4R	£29.45
XB27E	Disco 80 8R	£29.45
XQ79L	Forte 1250TC 8R	£21.75
XQ80B	Forte 1250TC 16R	£21.75
XQ81C	Forte C1285TC 8R	£28.45
XQ82D	Forte C1285TC 16R	£28.45

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XQ83E	C15 Bass 8R	£57.80
XQ84F	C15 Bass 16R	£57.80
XB28F	Power L/S Cabinet	£54.00
XQ05F	15 inch Power Cab	DIS
AF33L	Mini Speaker System	£45.50
AF34M	5W Spkr in Cab	£9.95
AF35Q	15W Spkr Pair	£33.50

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AF31J	20W Spkr Pair	£63.00
AF32K	PA Spkr in Cab	£21.99
XY79L	Ceiling Speaker	£11.75
YL15R	Bracket Minor 5	£6.50
YL16S	Bracket Bek 100	£13.90
WY14Q	Spkr Selector	DIS

SWITCHES

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FH97F	SPST Ultra Min Tggle	66p
FH98G	SPDT Ultra Min Tggle	69p
FH99H	DPDT Ultra Min Tggle	79p
FH00A	Sub-Min Toggle A	70p
FF70M	Sub-Min Toggle J	80p
FH01B	Sub-Min Toggle B	89p
FH02C	Sub-Min Toggle C	89p■
FH03D	Sub-Min Toggle D	£1.06
FH04E	Sub-Min Toggle E	99p
FF71N	Sub-Min Toggle K	£2.35
FH05F	Sub-Min Toggle F	£1.29
FH06G	Sub-Min Toggle G	£1.10
FH07H	Sub-Min Toggle H	£1.25
FF72P	Sub-Min Toggle L	£2.15
FH08J	4-Pole SM Toggle	£2.35
FH39N	Toggle Sw	60p
YL01B	Toggle Switch Cover	47p
FH10L	Std Toggle SPST	50p
FH11M	Std Toggle SPDT	57p
FH12N	Std Toggle DPDT	77p
FH16S	H/D Toggle Type 1	DIS
FH17T	H/D Toggle Type 4	£4.25
FH18U	H/D Toggle Type 7	£1.95
FH19V	H/D Toggle Type 8	£4.40
FH20W	H/D Toggle Type 9	£4.30

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FH13P	Duck Bill Toggle	55p
FH14Q	Long-Arm Tgl Locking	90p
FH15R	Long-Arm Tgl Flasher	99p
YX56L	Chrome Bar Toggle	85p
YX54U	Min Rocker SPST	69p
YX55V	Min Rocker DPDT	£1.15
FH21X	Hekla Switch Black	DIS
FH22Y	Hekla Switch Blue	DIS
FH23A	Hekla Switch Green	DIS
FH24B	Hekla Switch Luminous	DIS
FH25C	Hekla Switch Red	DIS
FH26D	Hekla Switch White	DIS
FH27E	Hekla Switch Yellow	DIS
FH30H	SPST Rocker	39p
FH31J	SPDT Rocker	49p
YR68Y	Rocker Neon	63p
YR69A	Rocker Sw DP	69p
FH34M	DPDT Rocker	98p
•YR70M	Dual Rocker Neon	£1.10
XX26D	DIL Switch SPST Dual	£1.20
XX27E	DIL Switch SPST Octl	£1.50■
XX28F	DIL Switch SPDT Sgl	95p
XX29G	DIL Switch SPDT Quad	£3.95
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FF73Q	Rotary SW12B	70p
FF74R	Rotary SW6B	70p
FF75S	Rotary SW4B	70p
FF76H	Rotary SW3B	70p
FH42V	Rotary SW12	70p
FH43W	Rotary SW6	70p
FH44X	Rotary SW4	70p
FH45Y	Rotary SW3	70p
FF83E	Thumbwheel Decimal	£4.95
FF84F	Thumbwheel BCD	£4.55
FF86T	Thumbwheel Mtg Kit	£1.35■
YR77J	Push Wheel BCD	£5.45
YR78K	Push Wheel Spacer	48p
YR79L	Push Whl End Cheeks	99p
FH40T	Key Switch	£3.60
FH57M	Rotary Mains	75p
FH95D	Roller Microswitch	£1.15
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FH46A	Maka Shaft	£1.10
FH47B	Maka Wafer 1p 12w	£1.06
FH48C	Maka Wafer 2p 6w	£1.06
FF81C	Maka Wafer 2p 9w	£1.25
FH50E	Maka Wafer 4p 3w	£1.10
FH51F	Maka Wafer 6p 2w	£1.17
FH52G	Maka Wafer 1p 12w MB	75p
FH53H	Maka Wafer 2p 6w MB	£1.05
FF82D	Maka Wafer 2p 9w MB	29p
FH54J	Maka Mains	63p
FH55K	Maka Screen	5p
FF87U	Click Switch	30p
FF88V	Click Cap Black	18p
FF89W	Click Cap Blue	18p■
FF90X	Click Cap Green	18p
FF91Y	Click Cap Grey	18p
FF92A	Click Cap Ivory	18p
FF93B	Click Cap Red	18p
FF94C	Click Cap White	18p
FF95D	Click Cap Yellow	18p■
FF61R	Keyboard Switch	23p
FF62S	Keytop 1 Position	18p
FF63T	Keytop 2 Position	38p
FF64U	Keytop 3 Position	56p
FF65V	ASCII Transparency	£1.35
YR71N	Switch Contact Sheet	£1.49
Page 279		
FF77J	SP Slide	12p
FH35Q	Sub-Min Slide	15p
FF79L	Long Chrome Slide	22p
FH36P	Std Slide Switch	15p
FH38R	4-Pole Slide	69p
YR67X	HQ Push Switch	39p
FH59P	Push Switch	17p■
FH60Q	Break Push	23p■
FH91Y	Motor-Start Press	43p
FF96E	Square Push Black	77p
FF97F	Square Push Green	77p
FF98G	Square Push Red	77p
FF99H	Square Push Yellow	77p
YW41U	Square Psh Lck Black	75p
YW42V	Square Psh Lck Green	DIS
YW43W	Square Psh Lck Red	75p
YW44X	Square Psh Lck Yllow	75p
FH41U	Pushlock SPCO	£1.20
FH66W	Pushlock DPCO	£1.45
FH94C	Pressil Switch	28p
Page 280		
FH92A	Press Toe Sw Type 1	£1.20
FH93B	Press Toe Sw Type 2	£1.95
•LB64U	Foot Switch 2.5mm Jk	£4.25
FH37S	Mains Push	£1.10
LB91Y	Flasher Unit 2 Way	£4.95
LQ00A	Beginners Morse Key	£1.90
LQ01B	Professl Morse Key	£5.40
HY00A	Touch Pads Rect	22p
HY01B	Touch Pads Tri	27p
YR88V	Solenoid 12V	£4.75
YR89W	Solenoid 240V AC	£4.85
Page 281		
FH67X	Latchswitch 2-pole	46p
FH68Y	Latchswitch 4-pole	59p
FH69A	Latchswitch 6-pole	99p
FH70M	Latchswitch 8-pole	£1.45
FH71N	Latchswitch 10-pole	£1.25
BW11M	Latchsoft 2-pole	60p
BW12N	Latchsoft 4-pole	£1.20
FH72P	Latchdummy	32p
FH74R	Mains Latchswitch	£1.49
FH75S	Latchbracket Single	13p
FH76H	Latchbracket 2-way	38p
FH78K	Latchbracket 4-way	39p
FH80B	Latchbracket 6-way	55p
FH82D	Latchbracket 8-way	59p
FH84F	Latchbracket 10-way	69p
Page 282		
FL31J	Rd Latchbutton Black	14p
FL32K	Rd Latchbutton Green	14p
FL33L	Rd Latchbutton Grey	14p
FL34M	Rd Latchbutton Red	14p
FL35Q	Rd Latchbutton White	14p
FL36P	Rd Latchbutton Chrm	22p
BW13P	Sm Latchbutton Black	11p
BW14Q	Sm Latchbutton Chrm	33p
FH61R	Rct Latchbutton Blk	13p
FH62S	Rct Latchbutton Grey	13p
FH63T	Rct Latchbutton Red	13p
FH64U	Rct Latchbutton White	13p
FH87U	Magiclight Button Bl	23p
†FH88V	Magiclight Buttn Grn	26p
FH89W	Magiclight Button Or	42p
FH90X	Magiclight Button Yl	49p
BW15R	Latchbush Blue	39p
BW16S	Latchbush Green	45p
BW17T	Latchbush Orange	45p
BW18U	Latchbush Yellow	39p
Page 283		
YX94C	Ultra-Min Relay SPDT	83p
YX95D	Ultra-Min Relay DPDT	£1.35
YX96E	3A Min Relay	89p
YX97F	10A Mains Relay	£1.65
YX98G	5A Mains Relay	£3.20
Page 284		
YX99H	12V 30A Relay	£2.15
FX23A	Open Relay 6V	£3.25
FX24B	Open Relay 12V	£3.88
FX26D	2p Sub-Min Relay 6V	£3.45
FX27E	2p Sub-Min Relay 12V	£3.45
†FX28F	2p Sub-Min Relay 24V	£3.75
FX30H	4p Sub-Min Relay 12V	£3.95
Page 285		
HY20W	Relay Flat 12V	£2.43
FX48C	Power Relay 12V	£3.95
FX49D	Power Relay 230V AC	£4.25
YB89W	Car Relay Single	DIS
FX50E	Reed Relay 6 to 9V	£1.98
FX51F	Reed Relay 9 to 12V	£2.15
FX73Q	Reed Relay 12 to 18V	£2.15
FX74R	Reed Relay 18 to 30V	£2.95
Page 286		
FX88V	Dil Reed Relay 1p 5V	£1.95
FX89W	Dil Reed Relay 1p12V	£2.15
FX90X	Dil Reed Relay 2p 5V	£3.99
FX91Y	Dil Reed Relay 2p12V	£3.85
FX92A	Dil Rd Relay 1pC/05V	£8.25
FX93B	Dil Rd Rly 1p C/O12V	£8.39
FX68Y	Reed SW Standard	89p
FX69A	Reed SW Compact	£1.75
FX70M	Reed SW Miniature	69p
FX71N	Magnet Small	38p
FX72P	Magnet Large	88p
HB13P	Sw Former Stan One	DIS
HB17T	Sw Former Min One	DIS
HB15R	Sw Former Comp One	75p
TEST GEAR		
Page 287		
HF19V	Test Prod Black	45p
HF20W	Test Prod Red	45p
YX57M	Min Probe Black	38p
YX58N	Min Probe Blue	38p
YX59P	Min Probe Green	38p
YX60Q	Min Probe Red	38p
YX61R	Min Probe Yellow	38p
HF21X	Probe Clips	89p
HF30H	Pistol Probe Black	99p
HF31J	Pistol Probe Red	99p
HF22Y	Lo-Cost Test Probe	74p
HF32K	Moulded Test Probe	79p
HF33L	4mm Test Probe	89p
YR94C	AVO-type Test Lead	£4.45
YR93B	Test Lead Kit	£2.75
FY73Q	Logic Probe	£9.50■
Page 288		
FY88V	Continuity Probe	99p
FL61R	Signal Injector	£5.99
BW05F	Scope Probe BNC	£15.63
BR89W	Scope Probe 4mm	£16.25
FY74R	IC Test Clip	£2.85
YB21X	Safebloc	£7.50
YR95D	Lo-Cost Scope Probe	£3.75
Page 289		
XB82D	Calscope Super 6	DIS
	Carr in UK with XB82	DIS
•XB83E	Scopex 14D-10	£286.00
	Carr in UK with XB83	£9.45
Page 290		
XY05F	500MHz Freqncy Cntr	£115.95
LH05F	Transistor Testr HFE	£15.20
YB82D	LCR Bridge	£25.30
YB81C	Seesure Sig Gen	£26.75
YW93B	Low Cost Multimeter	£4.85
FL60Q	Pocket Multimeter	£7.50
Page 291		
YB83E	Small Multimeter	£15.95
YW68Y	Multimeter Type 320	£16.25
LH93B	Taut-Band Multimeter	£23.95
YB87U	100K Multitester	£44.00
Page 292		
YB84F	Microtest 80	£19.09
YB85G	Supertester 680G	£28.96
YB86T	Supertester 680R	£37.80
Page 293		
LH80B	Clamp Meter	£26.90
LH94C	DMM 200	£47.50
LH95D	DMM 100	£88.61
Page 294		
YL12N	HV Probe	£8.91
YL13P	Shunt 25A	£8.91
YL14Q	Shunt 100A	£8.91
XY75S	Ham Multimeter	£31.95
WY18U	SWR Meter 310	£10.75
Page 295		
WY19V	SWR Meter 110	£14.75
WY20W	Transtest UH74	£19.75
WY21X	SWR Meter 178	£24.95
YB04E	Grid Dip Meter	£45.00
TOOLS		
Page 296		
LH15R	Hobby Box	£3.45
FR22Y	Storage Drawer	95p
BR48C	Hex Trimmer	24p
BR51F	Trim Tool	45p
BR49D	Preset Trimmer	68p
BR50E	Trim TT5	60p
FY07H	Min Screwdriver Set	85p
BR58N	Jewllers Scrwdvr Set	£2.30
BR79L	Intrchgbl Scdrvr Set	£1.69■
YW60Q	Min Tool Set	£2.10
FY08J	Utility Set	£4.49
Page 297		
YX74R	Min Screwdriver	10p
BR52G	Small Screwdriver	34p
BR53H	Large Screwdriver	36p
YG24B	Driver S2	16p
FY10L	Driver S3	26p■
FY12N	Driver S5	95p
FY13P	Driver S6	63p
FY15R	Pozidriver P1	73p
FY17T	Pozidriver P2	99p
BR71N	Mains Tester	60p
LH75S	Spiraldriver	£4.25
YW92A	Ratchet Socket Set	£5.99
WY04E	Cushiongrip Drvr Set	£5.25
FY19V	Low Cost Min Cutters	£4.25
BR75S	Ins Min Cutters	£6.93
Page 298		
BR70M	Box-Joint Min Cutter	DIS
FY20W	Box-JT End Cutter	£5.60
FY21X	Low-Cost Cutters	£1.99
FY76H	Large Low Cost Cutts	£3.75
BR74R	Side Cutters	£5.95
FY22Y	Box Jt Side Cutters	£7.60
BR72P	Side Cutters S55	£4.50
FY23A	High Leverage Cutter	DIS
YW67X	Tweezers	19p
FY24B	Low Cost Min Pliers	£4.60
BR78K	Ins Min Snipe	£5.45
BR69A	Box Joint Min Pliers	£8.60
BR77J	Bright Pliers	£4.55
FY25C	Low-Cost Pliers	£1.95
FY26D	Box Combined Pliers	£3.99
Page 299		
FY27E	Low-Cost Long Pliers	£3.99
BR92A	Combination Pliers	£5.50
BR73Q	Long Snipe Pliers	£7.49
BR90X	Box Radio Pliers	£6.37
FY28F	Low-Cost Elec Pliers	£2.85
FY29G	Low-Cost HD Pliers	£2.45
BR91Y	Electricians Pliers	£4.90
FY30H	Pincers	£3.37
•FY31J	Crimp Tool	£2.15
BR76H	End Action Strippers	£5.99
BR93B	Wire Strippers 3A	£2.35
BR94C	Wire Strippers 8B	£1.49
BR95D	Wire Strippers 9	£3.96
BR96E	Stripmaster	£16.25
BR97F	Blade L5361	£6.20
XX11M	Blade L4421	£5.70
Page 300		
FY32K	Hand Wrap Tool	£6.48
HY16S	Verowire Pen	£4.49
HY17T	Verowire Spool	99p
FY33L	Verowire Comb	7p
FY34M	Allen Keys AF	£1.45
FY35Q	Allen Keys Metric	£1.35
YR82D	Min Spanner Set	£2.10
FY36P	Min Spanner 24	£1.15■
FY37S	Min Spanner 68	£1.15■
FY38R	Ring Spanner 02	£1.99
FY39N	Ring Spanner 46	£1.69
YW61R	Box Spanner Set	£2.15
YW62S	PSD6 Spanner Set	£4.75
FY45Y	Crescent Wrench 160	£3.35
FY46A	Crescent Wrench 210	£4.20
Page 301		
FY40T	Box Spanner 2BA	£1.25
FY41U	Box Spanner 4BA	£1.25
FY42V	Box Spanner 6BA	£1.25
FY43W	Box Spanner 8BA	£1.25
FY44X	Quick Grips	£5.40
FY47B	Adjustable Wrench	£3.20
•YW63T	Needle File Set	£5.60
FY49D	Needle File Flat Wrd	£1.53
FY50E	Needle File Hand	£1.75
FY51F	Needle File Halfrnd	£1.63
FY52G	Needle File Round	£2.27
BR63T	Junior Hacksaw	99p
BR64U	6in Hacksaw Blades	79p■
FY54J	Wire Brush	45p
FY55K	Wet & Dry Fine	18p
FY56L	Wet & Dry Med	19p
FY57M	Wet & Dry Course	25p
HX04E	Polish Block	£1.40
FY02C	Utility Knife	£1.60
FY03D	Retractable Knife	£1.99
FY04E	Knife Blades	99p
YW64U	Snap-Off Blade Knife	99p
Page 302		
FY05F	Scalpel Handle	£1.75■
FY06G	Scalpel Bld Type II	46p
BR59P	Punch 3/8in	£4.15
BR60Q	Punch 7/16in	£4.29
BR61R	Punch 1/2in	£4.35
BR62S	Punch 9/16in	£4.49
BR80B	Punch 5/8in	£4.45
BR81C	Punch 3/4in	£4.59
BR83E	Punch 1in	£5.20
BW00A	Punch 1 1/2in	£6.49
FY53H	Mini Vice	£3.45
LH79L	Reliant Kit	£19.78
BW03D	Reliant Drill	£7.60
BW02C	Titan Drill	£11.25
YW65V	Mini Mains Drill	£14.25
XB12N	Drill Stand	£14.95
BR84F	Reliant Collar	75p
BW04E	Drill Power Supply	£13.99
Page 303		
BR65V	Twist Burr 0.8mm	43p
BR66W	Twist Burr 1.4mm	43p
BR85G	HS Twist Drill 0.8mm	75p
BR86T	HS Twist Drill 1mm	75p
BR87U	HS Twist Drill 1.4mm	75p
YY28F	Long-Life Drill 1mm	£1.20
LH77J	20-Piece Tool Kit	£8.25
LH78K	40-Piece Tool Kit	£14.95
LH76H	Wishbone Sharpener	£6.25
YW66W	Pin Drill	£4.95
HQ02C	HS Drill 1/16in	19p
HQ03D	HS Drill 5/64in	23p■
HQ04E	HS Drill 3/32in	26p
HQ05F	HS Drill 7/64in	28p
HQ06G	HS Drill 1/8in	29p
HQ07H	HS Drill 9/64in	35p
HQ08J	HS Drill 5/32in	41p
HQ09K	HS Drill 11/64in	45p
HQ10L	HS Drill 3/16in	50p
HQ11M	HS Drill 13/64in	56p
HQ12N	HS Drill 7/32in	60p
HQ13P	HS Drill 15/64in	68p
HQ14Q	HS Drill 1/4in	75p
HQ15R	HS Drill 17/64in	89p
HQ16S	HS Drill 9/32in	96p
HQ17T	HS Drill 19/64in	£1.05
HQ18U	HS Drill 5/16in	£1.15
HQ19V	HS Drill 21/64in	£1.22
HQ20W	HS Drill 11/32in	£1.32
HQ21X	HS Drill 23/64in	£1.48
HQ22Y	HS Drill 3/8in	£1.49
HQ23A	HS Drill 25/64in	£1.55
HQ24B	HS Drill 13/32in	DIS
HQ25C	HS Drill 27/64in	£1.95
HQ26D	HS Drill 7/16in	£2.17
HQ27E	HS Drill 29/64in	£2.35
HQ28F	HS Drill 15/32in	£2.45
HQ29G	HS Drill 1/2in	£2.75
FY58N	Round Tape Rule	DIS
FY59P	Retractable Rule	£2.75
FY60Q	Feeler Gauge Imp	95p
FY61R	Feeler Gauge Metric	97p
Page 304		
FY62S	Iron CX	£5.95
FY63T	Element CX	£2.75
FR30H	Bit 6/1106	89p
FY64U	Bit 1100	84p
FY65V	Bit 1101	84p
FR31J	Bit 7/1101	£1.21
FY66W	Bit 1102	90p
FY67X	Bit 1103	88p
FR01B	Element Type CN	£2.65
FR02C	Handle Type CN	85p
FR03D	Bit 102	84p
FR04E	Bit 104	88p
FR05F	Bit 106	84p
FR06G	Bit 820	84p
FR07H	Bit 821	84p
FR08J	Bit 822	84p
FR12N	Iron X25	£5.95
FR13P	12V Iron MLX12	£7.20
FR14Q	Element X25	£2.75■
FR15R	Element MLX12	£2.45
FR16S	Bit No. 50	84p
FR17T	Bit No. 51	84p
FR18U	Bit No. 52	84p
FR20W	Stand ST3	£2.95
FR11M	Sponge	11p
FY68Y	Kit SK3	£8.45
Page 305		
FY69A	Kit SK4	£8.45
WY05F	Rechargeable Iron	£26.95
YX67X	B50 Bit Round	£2.95
YX68Y	B50 Bit Angled	£3.45
YX69A	B50 Bit Flattened	£3.65
YX70M	B50 Lamp	85p
YX71N	B50 Holder	62p
YX72P	B50 Sponge	29p
FR10L	Heat Sink Tweezers	19p
FR23A	Solder Sucker	£4.50
FR24B	Sucker Tiplet	£1.55
FR26D	Desolder Tool	£7.25
HY13P	Desldr Nozzle Type 2	89p
FR63T	Desldr Washer Type 2	24p
FR27E	Desolder Washer	DIS
FR28F	Desolder Nozzle	£1.55
FR29G	Solda-Mop	90p
FR21X	Solder D622	75p
FY70M	1/2kg Reel Solder	£10.85
FY71N	Alum Solder 1m Pk	43p
Page 306		
FY72P	Conductive Paint	£5.35
LH04E	Freeze-it	£1.75
LH03D	Switch Cleaner	£1.82
YB77J	Servisol	£1.66
LH02C	Aero-Klene	£1.55
YB73Q	Aero-Duster	£1.75
YB74R	Silicone Grease	£1.98
YB75S	Plastic Seal	£1.55
YB76H	Foam Cleanser	£2.35
YB78K	Excel Polish	£1.70
YB79L	Anti-Static Spray	£1.45
YB80B	Fire Extinguisher	£4.85
FL43W	Evostik Impact	99p
Page 307		
FL46A	Cyanoacrylate	£1.55
LQ02C	Potting Compound	£3.55
FL44X	Araldite Rapid	£2.25
FL45Y	Double Bubble Sachet	25p
FL47B	PVC Tape Black	35p
FL48C	PVC Tape Blue	35p
FL49D	PVC Tape Brown	35p
FL50E	PVC Tape Green	35p
FL51F	PVC Tape Red	35p
FL52G	PVC Tape White	35p
YR99H	PVC Tape Yellow	35p
WOUND PARTS		
Page 308		
LB40T	9.5 Coil Former	60p
LB17T	Former 351	24p
LB18U	Former 450	16p
LB19V	Former 722/1	13p
LB20W	Former 722/2	13p
LB21X	Former 722/8	13p
LB22Y	Former 722/4	13p
LB41U	Dust Core Type 4	10p
LB42V	Dust Core Type 6	11p
LB43W	Dust Core Type 8	17p
LB44X	Former Base	12p
LB36P	Screening Can 10	10p
LB37S	Screening Can 13	DIS
LB39N	Screening Can 15	14p
LB38R	Screening Can 14	DIS
LB62S	A/P Beads	35p
HX05F	Small Pot Core	£1.30
HX06G	Core Type 2	£1.45
Page 309		
HX07H	Bobbin Type 2	75p
HX08J	Clips Type 2	4p
HX09K	Type 3 Core	£1.85
HX10L	Type 3 Bobbin	42p
HX11M	Type 3 Clips	4p
HX12N	Large Pot Core	99p
HX13P	Bobbin Type 4	10p
HX14Q	Mtg System Type 4	89p
HW23A	GE Coil L15	£1.95
HX58N	GE Coil L9	£2.20
HX57M	GE Coil L8	£2.20
HW24B	GE Coil L14	£1.9[illegible]
HX56L	GE Coil L7	£2.20
HX55K	GE Coil L6	£2.20
HX54J	GE Coil L5	£2.25
HW25C	GE Coil L12	£1.99
HW26D	GE Coil L11	£1.99
Page 310		
HX24B	Choke 0.5H	£1.15
HX25C	Choke 1H	£1.15
HX26D	Choke 2H	£1.15
HX27E	Choke 4H	£1.15
LR07H	Filter Pot Core	£2.15
XX30H	Equaliser Pot Core	£1.99
HW27E	Choke 10H	£1.55
HW28F	Choke 5uH HC	48p
HX15R	Choke 1.5mH	48p
HX16S	Choke 2.5mH	54p
HX17T	Choke 5mH	54p
HX18U	Choke 7.5mH	66p
HX19V	Choke 10mH	29p
HX22Y	Choke RFC5	£2.10
HX23A	Choke RFC9A	£2.20
WH25C	Choke 0.22uH	48p
WH27E	Choke 0.47uH	53p
WH29G	Choke 1.0uH	45p
WH30H	Choke 1.5uH	45p
WH31J	Choke 2.2uH	45p■
WH32K	Choke 3.3uH	45p
WH33L	Choke 4.7uH	49p
WH34M	Choke 6.8uH	55p
WH35Q	Choke 10.0uH	45p
WH36P	Choke 15.0uH	61p
WH37S	Choke 22.0uH	48p
WH38R	Choke 33.0uH	48p
WH39N	Choke 47.0uH	48p
WH41U	Choke 100uH	54p
WH45Y	Choke 470uH	55p
WH47B	Choke 1mH	75p
HX29G	Crystl Set Coil PCC1	£1.95
Page 311		
HX42V	Toko YRCS 11098	46p
YG30H	Toko YRCS12374	44p
HX43W	Toko YHCS 11100	46p
YG31J	Toko CSK3464	47p
YG32K	Toko YMCS17104	47p
HX97F	Toko ACS 34342	59p
HX98G	Toko ACS 34343	46p
YG39N	Toko KAC8448	48p
YG36P	Toko KAC8449	46p
LB00A	IFT 13	£1.48
LB01B	IFT 14	£1.75
LB03D	IFT 16	£1.72
LB04E	IFT 17	£1.75
LB02C	IFT 15	£1.81
LB05F	IFT 18 465kHz	£2.19
LB06G	IFT 18 1.6MHz	£1.68
HX28F	Toc 1	£1.99
HX69A	Trans Coil 1T Blue	£2.57
HX70M	Trans Coil 1T Red	£2.17
HX71N	Trans Coil 1T White	£2.95
HX72P	Trans Coil 1T Yellow	£2.26
HX73Q	Trans Coil 2T Blue	£2.17
HX74R	Trans Coil 2T Red	£2.20
HX75S	Trans Coil 2T White	£1.48
HX76H	Trans Coil 2T Yellow	£1.88
HX77J	Trans Coil 3T Blue	£2.17
HX78K	Trans Coil 3T Red	£2.17
HX79L	Trans Coil 3T White	£2.17
HX80B	Trans Coil 3T Yellow	£2.20
HX89W	Trans Coil 4T Blue	£2.17
HX90X	Trnas Coil 4T Red	£2.17
HX91Y	Trans Coil 4T White	£2.45
HX92A	Trans Coil 4T Yellow	£2.20
HX93B	Trans Coil 5T Blue	£1.70
HX94C	Trans Coil 5T Red	£2.17
HX95D	Trans Coil 5T White	£2.11
HX96E	Trans Coil 5T Yellow	£2.16
Page 312		
HX82D	Min Tr LT44	55p
LB14Q	Min Tr LT700	55p
YR91Y	Min Tr LT800	33p
WB00A	Sub-Min Tr 6V	£1.30
WB01B	Sub-Min Tr 9V	£1.30
WB02C	Sub-Min Tr 12V	£1.40
WB06G	Min Tr 6V	£3.15
WB11M	Min Tr 9V	£4.25
WB10L	Min Tr 12V	£3.35
WB15R	Min Tr 15V	£3.35
LY03D	Tr 10VA 15V	£4.95
WB16S	Min Tr 20V	£3.35
WB20W	Min Tr 24V	£3.35
WB21X	Min Tr 36V	DIS
WB25C	Tr 12V 1A	£6.55
WB26D	Tr 12V 2A	£7.75
WB03D	Tr 9V 1.1/2A	£6.25
WB12N	Tr 20V 1A	£8.25
WB17T	Tr 28V 1.1/2A	£9.95
XB38R	TR 32032/6.1/2A	£23.25
HX59P	Trnsformer Mtg Plate	66p
Page 313		
WB07H	Tr 34V 1A	£7.85
WB22Y	Tr 34V HP	£8.15
LW34M	15/22V Power Tran	£13.95
LW33L	Tr 240V Isotran	£4.95
HX81C	Pulse Transformer	£2.65
†WB28F	Clock Transformer	£1.75■
YX66W	Line Transformer	£3.35
LB70M	Mic Xformer MX5	DIS
LB71N	Mic Xformer MX6	DIS
LR05F	Mic Xfrm Typ2 20-30R	DIS
LR06G	Mc Xfm Typ2 200-600R	£19.45
YX84F	Z Changer	£7.85
Page 314		
YG12N	Min Motor	£2.45
YG13P	Small Motor	£1.25
YG14Q	Servo Mechanism	£3.60

NEW ITEMS PRICE LIST

The following is a list of all items introduced prior to this price list, but since publication of our 1981/82 catalogue and includes all special items for projects that appeared in the March 1981 to February 1982 issues of Electronics & Music Maker.

AERIALS & AMATEUR RADIO

YG41U	27MHz Rubber Duck	Price £4.75
YK00A	2m Scanning Receiver	Price £54.95

BATTERIES

HW31J	Nicad PP3	Price £5.95
HW32K	PP3 Nicad Charger	Price £6.95
HY32K	Large Battery Holder	Price £1.85

BOOKS, MAGAZINES AND LEAFLETS

GG24B	Analog Subscription	Price £9.00*NV*
WG01B	Practical Electronics Handbook by Ian Sinclair	Price £4.70*NV*
WG02C	Newnes Book of Video by K. G. Jackson	Price £6.90*NV*
WG03D	Introduction To Pascal by Rodnay Zaks	Price £10.75*NV*
WG04E	A Basic Approach to BASIC by Henry Mullish	Price £9.85*NV*
WG05F	Atari BASIC by Albrecht	Price £7.95*NV*
WG06G	Consumers Guide To Personal Computing & Microcomputers by Freiberger	Price £8.25*NV*
WG07H	Beat The Odds by Hans Sagan	Price £7.00*NV*
WG08J	BASIC With Business Applications by Lott	Price £9.89*NV*
WG09K	Introduction to Computer Music by Bateman	Price £15.60*NV*
WG10L	Basic Electricity by C. Ryan	Price £6.65*NV*
WG11M	Electronics by H. Kybett	Price £5.85*NV*
WG12N	BASIC by Albrecht	Price £7.35*NV*
WG13P	BASIC for Home Computers by Albrecht	Price £6.75*NV*
WG14Q	TRS80 BASIC by Albrecht	Price £7.70*NV*
WG15R	Using CP/M by Fernandez	Price £6.65*NV*
WG16S	Flowcharting by N. Stern	Price £6.85*NV*
WG17T	The S-100 Bus Handbook by D. Bursky	Price £13.25*NV*
WG18U	Telephone Accessories You Can Build by J. H. Gilder	Price £6.45*NV*
WG19V	60 Challenging Problems with BASIC Solutions by D. Spencer	Price £5.75*NV*
WG20W	The Best Book On CB by E. Herbert	Price £5.40*NV*
WG21X	Z80 & 8080 Assembly Language Programming by K. Spracklen	Price £6.75*NV*
WG22Y	Intel Memory Book	Price £19.35*NV*
WG23A	Intel 8080/8085 Book	Price £16.95*NV*
WG24B	8086 Primer by S. Morse	Price £7.65*NV*
WG25C	Writing Interactive Compilers & Interpreters by P. Brown	Price £13.45*NV*
WG26D	Foundations of Programming with Pascal by L. Moore	Price £6.24*NV*
WG27E	What To Do After You Hit Return by The People's Computer Company	Price £13.45*NV*
WG28F	VMOS Projects by R. A. Penfold	Price £2.15*NV*
WG29G	Digital IC Projects by F. G. Rayer	Price £2.15*NV*
WG30H	International Transistor Equivalents Guide by Adrian Michaels	Price £3.25*NV*
WG31J	Fifty BASIC Exercises by J. P. Lamoitier	Price £10.45*NV*
WG32K	The Pascal Handbook by Jacques Tiberghien	Price £12.15*NV*
WG33L	Learning BASIC With Your Sinclair ZX80 by Robin Norman	Price £4.75*NV*
WG34M	Oscilloscopes: How To Use Them: How They Work by Ian Hickman	Price £4.20*NV*
WG35Q	More Telephone Accessories You Can Build by Jules H. Gilder	Price £5.46*NV*
WG36P	The Joy Of Minis And Micros by Philip Stein and Howard Shapiro	Price £7.55*NV*
WG37S	Problem Solving Principles For Programmers by William E. Lewis	Price £8.85*NV*
WG38R	Computer Programs That Work by J. D. Lee, G. Beech and T. D. Lee	Price £4.75*NV*
WG39N	Successful Software For Small Computers by Graham Beech	Price £7.00*NV*
WG40T	Musical Applications of Microprocessors by Hal Chamberlin	Price £22.65*NV*
WG41U	Apple II Users Guide by Lon Poole	Price £13.95*NV*
WG42V	An Introduction To BASIC Programming Techniques by S. Daly	Price £2.15*NV*
WG43W	50 Simple LED Circuits Book 2 by R. N. Soar	Price £1.50*NV*
WG44X	Introducing Amateur Electronics by Ian R. Sinclair	Price £3.95*NV*
WG45Y	33 Challenging Computer Games For TRS80/Apple/PET by David Chance	Price £6.25*NV*
WG46A	Audio Projects by F. G. Rayer	Price £2.15*NV*
WG47B	Robot Intelligence ... With Experiments by David L. Heiserman	Price £7.50*NV*
WG48C	BASIC Computer Programs For Business Vol. 1 by Charles D. Sternberg	Price £9.25*NV*
WG49D	Inside BASIC Games by Richard Mateosian	Price £12.35*NV*
WG50E	Electronic Projects In Photography by R. A. and J. W. Penfold	Price £3.95*NV*
WG51F	More Electronic Projects In The Home by Andy Flind	Price £3.95*NV*
WG52G	Projects In Amateur Radio by F. G. Rayer	Price £3.95*NV*
WG53H	Electronic Test Equipment Projects by Alan C. Ainslie	Price £3.95*NV*
WG54J	Electronic Projects For Home Security by Owen Bishop	Price £3.95*NV*
WG55K	Atari Basic Learning By Using by Thomas E. Rowley	Price £4.95*NV*
WG56L	Atari OPSYS Users Manual	Price £16.95*NV*
WG57M	The Giant Handbook Of Electronic Circuits by Raymond A. Collins	Price £12.99*NV*
WG58N	The Master IC Cookbook by Clayton L. Hallmark	Price £8.45*NV*
WG59P	An Introduction To Radio DXing by R. A. Penfold	Price £2.15*NV*
WG60Q	Model Railway Projects by R. A. Penfold	Price £2.15*NV*
WG61R	Android Design by Martin Bradley Weinstein	Price £9.99*NV*
WG62S	My Micro Speaks BASEX (And Loves It) by Paul Warme	Price £8.85*NV*
WG63T	Programmer's Guide To The 1802 by Tom Swan	Price £6.85*NV*
WG64U	Programs For Beginners On The TRS80 by Fred Blechman	Price £8.25*NV*
WG65V	Karel The Robot by Richard E. Pattis	Price £5.75*NV*
WG66W	Introduction To 8080/8085 Assembly Language Programming by Fernandez/Ashley	Price £7.45*NV*
WG67X	Programming in Basic-Plus by Swatzky/Chen	Price £11.75*NV*
WG68Y	Introducing Microprocessors by Ian R. Sinclair	Price £4.95*NV*
WG69A	Public Address Handbook by Vivian Capel	Price £8.75*NV*
WG70M	The British CB Book by Peter Chippindale	Price £4.45*NV*
WG71N	Electronic Projects For Cars And Boats by R. A. Penfold	Price £2.10*NV*
WG72P	Electronic Timer Projects by F. G. Rayer	Price £2.10*NV*
WG73Q	CB Projects by R. A. Penfold	Price £2.10*NV*
XA00A	Maplin Magazine Subscription	Price £2.40*NV*
XA01B	Maplin Magazine Vol. 1 No. 1	Price 60p*NV*
XA02C	Maplin Magazine Vol. 1 No. 2	Price 60p*NV*
XF45Y	E&MM March 1981 Issue	Price £1.00*NV*
XF46A	E&MM April 1981 Issue	Price £1.00*NV*
XF47B	E&MM May 1981 Issue	Price £1.00*NV*
XF48C	E&MM June 1981 Issue	Price £1.00*NV*
XF49D	E&MM July 1981 Issue	Price £1.00*NV*
XF50E	E&MM August 1981 Issue	Price £1.00*NV*
XF51F	E&MM September 1981 Issue	Price £1.00*NV*
XF52G	E&MM October 1981 Issue	Price £1.00*NV*
XF53H	E&MM November 1981 Issue	Price £1.00*NV*
XF54J	E&MM December 1981 Issue	Price £1.10*NV*
XF55K	E&MM January 1982 Issue	Price £1.10*NV*
XF56L	E&MM February 1982 Issue	Price £1.10*NV*
XH52G	Atari Software Leaflet (Issue 2)	Free
XH53H	Matinee Component Identification Leaflet	Price 40p*NV*
XH54J	Atari Hardware Leaflet	Free
XH55K	Matinee Organ Book	Price £2.50*NV*
XH56L	Spectrum Synthesiser Book	Price £1.00*NV*

BOXES

HY25C	Display Box	Price 50p
YK24B	Calculator Style Verobox	Price £4.45

CONNECTORS

BH61R	Minicon Latch Plug 17-Way	Price 58p
BH64U	Minicon Plug 17-Way	Price 46p
BH65V	Minicon Latch Housing 6-Way	Price 13p
BH66W	Minicon Latch Housing 5-Way	Price 11p
BH67X	Right-Angle Minicon Plug 15-Way	Price 65p
BX96E	Minicon Latch Plug 3-Way	Price 23p
BX97F	Minicon Latch Housing 3-Way	Price 11p
BX98G	Jumper Cable 17-Way	Price £3.65
FB99H	Right-Angle Latch Minicon Plug 6-Way	Price 40p
FH86T	Reset Spring	Price 3p
FY91Y	Right-Angle Latch Minicon Plug 4-Way	Price 33p
FY92A	Right-Angle Latch Minicon Plug 2-Way	Price 26p
FY93B	Minicon Latch Plug 5-Way	Price 26p
FY94C	Minicon Housing 10-Way	Price 18p
HB58N	Minicon Latch Housing 4-Way	Price 10p
HB59P	Minicon Latch Housing 2-Way	Price 8p
HB60Q	Latchbracket 5-Way	Price 27p
HF98G	Stereo Plastic 3.5mm Plug	Price 25p
HQ85G	Minicon Plug 10-way	Price 47p
HY26D	Latchbracket 16-Way	Price 72p
HY27E	Reset Bar 15-Way	Price 35p
HY28F	Latchbracket 9-Way	Price 39p
HY29G	Reset Bar 6-Way	Price 16p
YK06G	Pedalboard Cableform	Price £2.98

CONSUMER GOODS

AC41U	Othello Video Game Cartridge	Price £18.95
AC42V	Video Pinball Cartridge	Price £29.95
AC43W	Asteroids Video Game Cartridge	Price £29.95
AC44X	War Lords Game Cartridge	Price £29.95
AC45Y	Le Stick	Price £24.95
AC46A	Missile Command Video Game Cartridge	Price £29.95
AC47B	Flag Capture Video Game Cartridge	DIS
AF36P	Atari 400 with 16K RAM	Price £345.00
AF37S	Atari 400 with 32K RAM	Price £395.00
AF38R	Epson MX80T	Price £414.00
AF39N	Epson MX80F/T	Price £458.85
AF40T	Epson MX80F/T Mk II	Price £516.35
AF41U	Centronics Interface for Atari 400	Price £49.95
AF42V	Centronics Interface for Atari 800	Price £49.95
AF43W	Versawriter for Atari 400/800	Price £169.00
AF44X	32K RAM Module	Price £125.35
AF45Y	32K Upgrade for Atari 400	Price £75.00
HY24B	2-Roll Pack of Paper for Printer 822	Price £4.95

Software For Atari 400 and 800: See back cover. (Full details are on XH52G and XH54J both free.)

ELECTRICAL

WY23A	Timetouch Electronic Time Switch	Price £24.80

HARDWARE

HY30H	Isobolt M3 x 9mm (pk of 10)	Price 12p
HY31J	Steel Washer 4BA (pk of 10)	Price 11p

KNOBS

QY00A	LC Cap Black	Price 5p
QY01B	LC Cap Blue	Price 5p
QY02C	LC Cap Green	Price 5p
QY03D	LC Cap Grey	Price 5p
QY04E	LC Cap Red	Price 5p
QY05F	LC Cap White	Price 5p
QY06G	LC Cap Yellow	Price 5p
YG40T	Low-Cost Collet Knob	Price 27p

MICROPHONES

HY33L	Crystal Mic Insert (metal body)	Price 84p

OPTO-ELECTRICAL

QR54J	Rectangular Multicolour LED	Price 75p

ORGAN COMPONENTS

BH49D	Tablet Rocker Grey	Price 96p
BH50E	Tablet Rocker Orange	Price 96p
BH51F	Tablet Rocker Red	Price 96p
BH62S	Spacer Block	Price 4p
BH63T	Keyboard Spacer	Price 2p
BR98G	Drawbar Blue	Price £1.55
BR99H	Drawbar Green	£1.55
FB98G	Rubber Coupling	Price 66p
QY07H	Contact Springs	Price 8p
XB95D	Organ Stool	Price £29.50
XG00A	Roll-Top Guides (pair)	Price £2.50
XG01B	Music Stand	Price £4.75
XY89W	Switched Swell Pedal	Price £11.45
XY92A	Twin Keyboard and Frame	Price £49.90*
XY97F	Keyboard Separator	Price £1.95*
XY98G	Swell Pedal Housing and Trim	Price £3.75
XY99H	Roll Top	Price £19.50*

PCB EQUIPMENT

HQ84F	Verobloc Bracket	Price 63p
XX42V	MP Urobreadboard	Price £21.75

PROJECTS AND MODULES

BH60Q	Syntom Front Panel	Price £1.10
BX99H	Synwave Front Panel	Price £1.10
GA00A	Direct Input PCB	Price £1.10
GA01B	Line Driver PCB	Price £1.48
GA02C	Line Receiver PCB	Price £1.51
GA03D	Spectrum PSU PCB	Price £2.40
GA05F	Syntom PCB	Price £1.18
GA06G	PA Controller PSU PCB	Price £3.70
GA07H	PA Controller Limiter PCB	Price £2.85
GA08J	Woofer PCB	Price £2.00
GA09K	24-Way Contact PCB	Price £2.80
GA10L	25-Way Contact PCB	Price £2.87
GA11M	Continuity Tester PCB	Price £1.32
GA12N	Crossover PCB	Price £2.50
GA13P	Balanced Line Driver PCB	Price £2.10
GA14Q	PA Controller Display Component PCB	Price £1.25
GA15R	PA Controller Display LED PCB	Price £1.45
GA18U	Matinee PSU PCB	Price £2.10
GA19V	Battery Monitor PCB	Price £1.20
GA20W	Workshop PSU PCB	Price £4.30
GA21X	Workshop Control PCB	Price £2.20
GA22Y	Strobe Main PCB	Price £2.20
GA23A	Strobe HT PCB	Price £1.20
GA24B	Guitar Tuner PCB	Price £1.65
GA25C	Power Control PCB	Price £1.15
GA26D	Digital Tacho Main PCB	Price £1.75
GA27E	Digital Tacho Display PCB	Price £1.25
GA28F	75W Mosfet Amp PCB	Price £1.80
GA29G	Mosfet Amp Mounting Bracket	Price £1.15
GA30H	Noise Reduction Main PCB	Price £3.20
GA31J	Noise Reduction PSU PCB	Price £1.60
GA32K	Hexadrum PCB	Price £2.60
GA33L	Select-A-Match PCB	Price £1.80
GA34M	Powercomp Peripherals PSU PCB	Price £3.95
GA35Q	Synwave PCB	Price £1.10
GA36P	Spectrum VCO PCB	Price £4.75
GA40T	Car Aerial Booster PCB	Price £1.35
GA41U	Combo Amp PCB	Price £5.75
GA42V	Partylite PCB	Price £2.25
GA43W	Noise Gate PCB	Price £1.30
GA48C	Harmony Generator PCB	Price £2.25
GA50E	Effects Link PCB	Price £2.20
GA51F	Soundbooster PCB	Price £1.85
GA52G	FX-Swell PCB	Price £1.35
GA53H	Spectrum LFO PCB	Price £2.50
GA54J	Synclock PCB	Price £1.65
GA55K	Spectrum Controller PCB	Price £2.10
GA56L	MPC Board	Price £5.75
GA57M	Spectrum VCF PCB	Price £2.95
GA58N	The Bomb PCB	Price £1.55
GA59P	Spectrum Shaper PCB	Price £2.95
GA60Q	Percussion Sound Gen PCB	Price £4.72
GA61R	Timer Main PCB	Price £2.80
GA62S	Timer Switch Board	Price £3.85
GA63T	Timer Relay PCB	Price £1.10
GA64U	Timer Front Panel	Price £3.85
LW51F	75W Mosfet Amp Kit	Price £11.49
LW52G	Wordmaker Kit	Price £99.95
LW53H	5600S Synthesiser Kit	Price £599.95 Carriage extra £20.00
LW54J	3800 Synthesiser Kit	Price £336.75 Carriage extra £20.00
LW55K	Synclock Kit	Price £19.75
LW60Q	Spectrum Synth Kit	Price £167.50
XG03D	Combo Amp Front Panel	Price £3.35
XG05F	Matinee Modular Organ Kit	Price £399.45
XG08J	Spectrum Front Panel	Price £14.95
XX43W	Matinee Demonstration Cassette	Price £1.99
XX44X	Synclock Front Panel	Price £1.50
XX46A	Spectrum Joystick Panel	Price £2.25
XY86T	Matinee Main PCB	Price £50.00*
XY88V	Matinee Contact PCB	Price £7.30
XY90X	Spectrum Bus-bar Set	Price £2.20
XY91Y	Matinee Organ Kit	Price £299.95 Carriage extra £15.00
XY93B	Matinee Cabinet Kit	Price £99.50 Carriage extra £20.00
XY94C	Matinee Front Panel	£17.95*
XY95D	Matinee Metalwork Mounting Kit	Price £9.50*
XY96E	End Cheeks (set of 4)	Price £6.75
YK04E	Matinee PSU Bracket	Price £1.60
YK05F	Matinee Pot Mounting Bracket	Price 79p
YL26D	Guitar Tuner Front Panel	Price £1.10
YQ72P	Magnum Mode Change PCB	Price £1.65

RESISTORS

FX87U	Thermistor KR152CW	Price 73p

SEMICONDUCTORS

QR55K	634SS2	Price £4.95
QY08J	74C925	Price £6.75
QY09K	LM311N 8-pin	Price 55p
QY10L	NE570	Price £4.65
QY11M	2SC2547E	Price 28p
QY12N	2SA1085E	Price 28p
QY14Q	UAA170L	Price £2.50
QY15R	2716/M2	Price £10.50

SPEAKERS

QY13P	Piezo Transducer 27mm	Price 30p
QY16S	Rubber Disk 27mm	Price 5p
XG02C	Loudspeaker 12in. 30W TC30	Price £19.75

SWITCHES

BH58N	Co-ax Switch SO239	Price £6.99
BH59P	Co-ax Switch PL259	Price £6.99
HQ83E	Foot Microswitch	Price £3.25
HY34M	Click Key Black	Price 24p
YK26D	Pedal Switch Box	Price £5.95

TEST GEAR

YK01B	RF Frequency Meter	Price £69.95

TOOLS

YK27E	Chassis Punch Set	Price £13.45

WOUND COMPONENTS

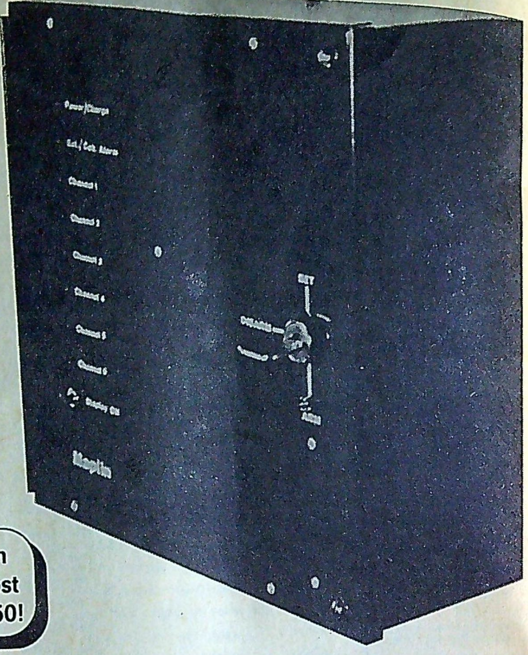
YK02C	Transformer 2A 32-0-32V	Price £13.45
YK03D	Matinee Transformer	Price £13.75
YK07H	Transformer 4A 32-0-32V	Price £22.25
YK08J	Toroidal 30VA 0-6, 0-6V	Price £6.80
YK09K	Toroidal 30VA 0-9, 0-9V	Price £6.80
YK10L	Toroidal 30VA 0-12, 0-12V	Price £6.80
YK11M	Toroidal 30VA 0-15, 0-15V	Price £6.80
YK12N	Toroidal 30VA 0-18, 0-18V	Price £6.80
YK13P	Toroidal 50VA 0-6, 0-6V	Price £7.46
YK14Q	Toroidal 50VA 0-9, 0-9V	Price £7.46
YK15R	Toroidal 50VA 0-12, 0-12V	Price £7.46
YK16S	Toroidal 50VA 0-15, 0-15V	Price £7.46
YK17T	Toroidal 80VA 0-18, 0-18V	Price £8.35
YK18U	Toroidal 80VA 0-22, 0-22V	Price £8.35
YK19V	Toroidal 80VA 0-30, 0-30V	Price £8.35
YK20W	Toroidal 120VA 0-30, 0-30V	Price £9.57
YK21X	Toroidal 160VA 0-35, 0-35V	Price £12.28
YK22Y	Toroidal 300VA 0-35, 0-35V	Price £16.41
YK23A	Toroidal 500VA 0-35, 0-35V	Price £21.22
YK25C	12VA 15V Transformer (PCB mounting)	Price £7.49
YK28F	Transformer 12V ½A	Price £4.25

***These items are too large to be sent through the ordinary inland mail and they will therefore be despatched by carrier. Please add £6.00 towards the cost of carriage to any order containing one or more of these items.**

HOME SECURITY SYSTEM

by Dave Goodman

- ★ **Six independent channels with two groups per channel**
- ★ **Two or four wire operation with line sensing of open or short circuit or resistance change (jumping)**
- ★ **Tamper-proof main cabinet**
- ★ **External horn loop control has its own open/short circuit and jumping protection**
- ★ **Presettable entry and exit delay timers**



Minimum system cost UNDER £50!

This new home security system offers a high degree of protection for domestic or commercial premises coupled with excellent long-term reliability. The unit is mains operated, but will run off its small internal nickel-cadmium rechargeable battery pack for 2 to 3 days depending on the size of the system. The internal battery is continuously charged when the mains is present and changeover from mains to battery and vice-versa has no effect on the system. CMOS circuitry is used throughout to minimise current drain.

There are sockets for six separate plug-in channels so that for example all downstairs windows could be connected to one input, all downstairs doors to another, all upstairs windows to another and perhaps shed and garage doors and windows to another. When setting the system you know immediately where to look for the window left open accidentally if the system will not set. Or parts of the system only may be set. For example, during the late evenings, the shed and garage circuit only could be set. Whatever your requirements this system offers the fullest possible flexibility for complete security.

The external horn is also fully protected when fitted with dry batteries. Its prominent position alone will deter most burglars, but any attempt to tamper with it will set it off. If the wires to it are cut or tampered with, the horn will sound. Even ripping the box off the wall will not stop the alarm. The recommended dry batteries will sound the alarm at full power for at least four hours even if the wires are cut.

The alarm is extremely easy to build, with internal wiring kept to an absolute minimum. Operation is by a single keyswitch and exit and entry delays may be preset to suit your requirements. There is an LED for each channel, giving monitoring facilities and an internal sounder giving 'alarm condition' tones. Even the main cabinet is protected, by a microswitch fitted to the PSU pcb.

Circuit Description

Mains PCB

The key switch S9, which is shown in Figure 1 with its contacts made, controls the 'disarm' and 'set' conditions of the alarm unit. TR1 is conducting and thus inhibiting the exit delay timer oscillator IC1c and d, and IC2, a 14 stage counter/divider, is held reset.

The oscillator IC1c and d is frequency variable between 25Hz (40ms) and 10kHz (100us). This clock signal is divided down by IC2 by 8192 giving a minimum time out period of 0.8s and a maximum period of 5.5 mins. So allowing for variations in tolerances, IC1c, d and IC2 function as an exit delay timer presettable by RV1 giving periods of between 0 and 6 mins.

IC1a, b and IC3 function as described above but are used as an entry delay timer, presettable by RV2.

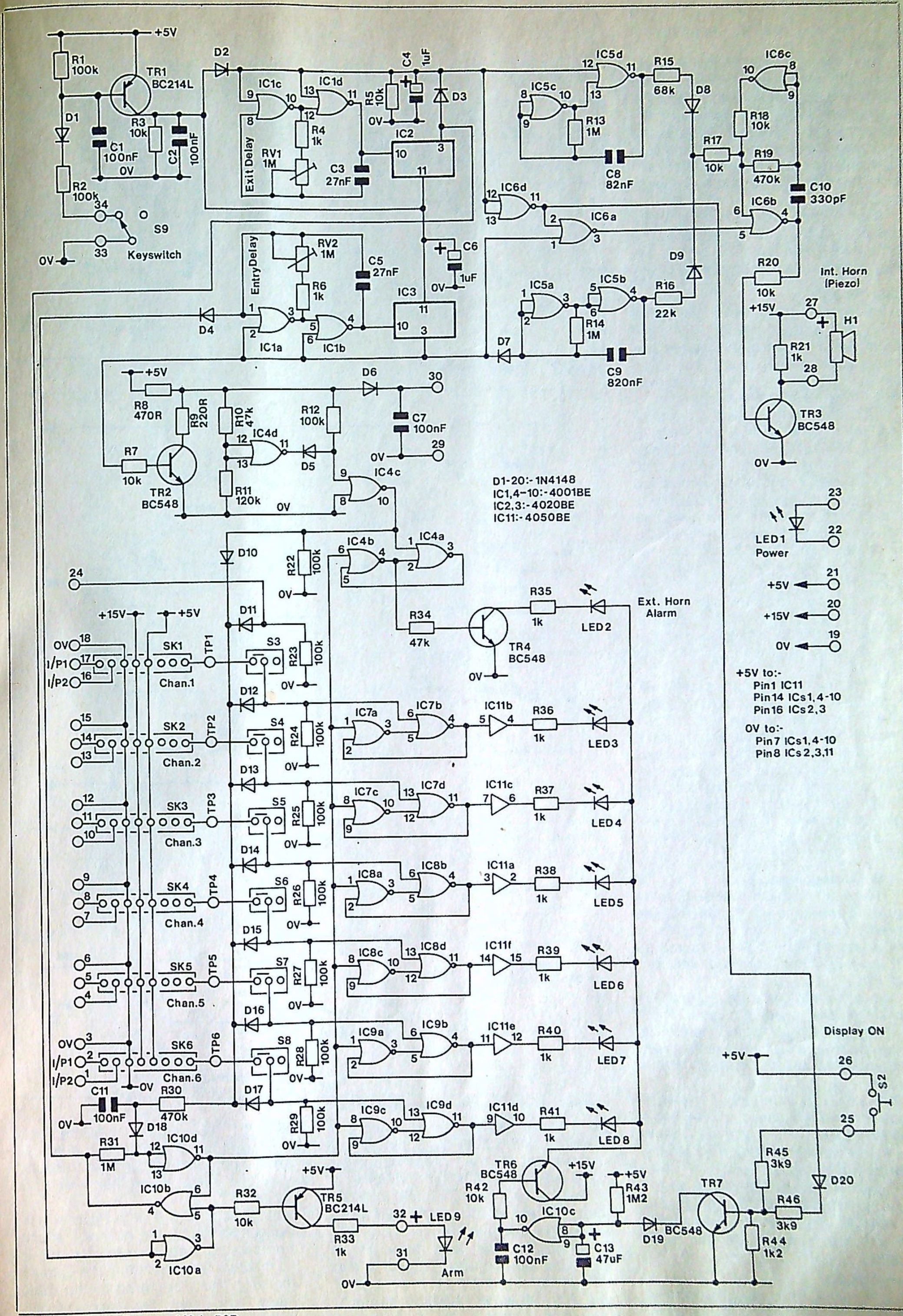
In the disarm mode IC2 pin 3 is at 0V and D2 is conducting. Consequently exit delay tone modulator IC5 c and d is inhibited. IC10a output is high, holding TR5 and LED9 ('ARM' LED) off. Latch IC10 b and d output is high. Entry delay timer is held off via D4 and IC10b output low. Counter IC3 pin 3 is low and alarm tone modulator IC5a and b is inhibited via D7 conducting.

Latches IC7, 8 and 9 have normally high outputs connected to LED buffer IC11 preventing channel LEDs 3 to 8 from turning on. A positive trigger pulse greater than 25ms in duration present at any of the inputs to the latches from switches S3 to 8 allows the channel LEDs to turn on for the duration of the triggering signal.

Switch S2 operates TR7 which discharges C13 and operates TR6, the LED display. TR6 remains on for the time constant set by R43 and C13, approximately 90s.

Operating switch S9 (contacts open) in the 'set' mode turns TR1 off. This removes the inhibit on the exit delay oscillator IC1c and d allowing it to run at the frequency determined by RV1. IC2 divides this signal and IC2 pin 3 goes high. While IC2 is counting, D2 is not conducting and IC5 c and d run at a frequency of approximately 8Hz. The inhibit on the tone generator IC6 b and c is removed allowing it to run at approximately 3kHz modulated at 8Hz.

At the end of the timing period, IC2 pin 3 goes high, inhibiting IC5d and IC6d. IC10a goes low, TR5 conducts and the 'ARM' LED turns on. IC10d inhibit is removed and a positive trigger pulse from switches S3 to 8 latches



D1-20:- 1N4148
IC1,4-10:- 4001BE
IC2,3:- 4020BE
IC11:- 4050BE

+5V to:-
Pin1 IC11
Pin14 ICs1,4-10
Pin16 ICs2,3

0V to:-
Pin7 ICs1,4-10
Pin8 ICs2,3,11

Figure 1. **Circuit diagram of Main PCB.**

IC10d low. The appropriate IC7, 8 or 9 goes low and latches, operating a channel LED.

This same trigger pulse also removes the inhibit on the entry delay oscillator IC1a and b via IC10 b and d. Consequently it begins to run at the frequency set by RV2. IC3 divides the clock signal and when pin 3 goes high the oscillator stops running, TR2 conducts, latching IC4 a and b, and operating LED 2.

Alarm tone modulator IC5a and b runs at 0 to 5 Hz and modulates the 3kHz tone oscillator IC6b and c developing the alarm tone signal at H1.

Power Supply

The power supply is shown in Figure 2. T1, BR1 and C2 provide 15V to the LED arrays, speaker output stages and charging circuit. C1 is a 0.1uF interference suppressor, which removes transient spikes from the mains.

LED1, R3, R1, TR1 and D1 form a constant current source for charging the six 1.2V nickel cadmium batteries used for power failure standby. The alarm current requirement is very low so that fully charged batteries will provide enough power for a few days. The trickle charge is set by R1 to 4mA and is temperature stabilised by LED1.

The supply voltage at pin 7 is approximately 15V and the battery supply is 7.5V. D2 will normally be reversed biased when mains voltage is applied and REG1 will deliver +5V at 100mA. LED1 also serves as a mains pilot light.

Removing the mains supply extinguishes LED1, removes the charging current and forward biases D2. Pin 7 drops to +7.5V while pin 8 remains at +5V. C3 and 4 ensure that no spurious spikes are produced during changeover to battery standby. The batteries should be checked periodically. If standby power is not required, short circuit pins 4 and 5 together to light LED1.

Break Contact Module

The break contact module shown in Figure 3 works on a balanced line system. The line (contact) inputs, 1 and 2, are set for +2.5V measured on TPA and TPB and adjusted with RV1 and RV2.

Up to five switch contacts (and 22k resistors) are used on each input allowing ten contacts per module as shown on Figure 18. The number used is dependant on the system mode chosen.

IC1 has R3 connected between input and inverting output. The gate is therefore used in its linear region and the output (at the test points) will be balanced at half the supply.

A high or low voltage swing, at the inputs, is detected by IC1a and d, and the output, normally low, will pulse high for the duration of the input change.

External Horn

The external horn circuit is shown in Figure 4. R1 terminates the security loop connected from pins 1 and 2 to pins 30 and 29 on the main PCB. A current, set at 3mA, is generated in the loop and cutting, short circuiting or reversing, will bias TR1 into conduction. TR2 will switch on and the battery pack then supplies H2.

Returning the loop back to its normal condition would appear to bias TR1 off and prevent H2 from operating. This does not happen, owing to detection circuit IC4c, d (Figure 1) R10, 11, 12 and D6 switching, and dropping the loop current down to 1mA. The horn will continue to sound until the main alarm key switch is turned off.

Please note that with internal batteries connected, the horn will sound immediately, until the security loop is connected. So when fitting the system, the loop must be wired to the main alarm first, and then connect the batteries (see Figure 9).

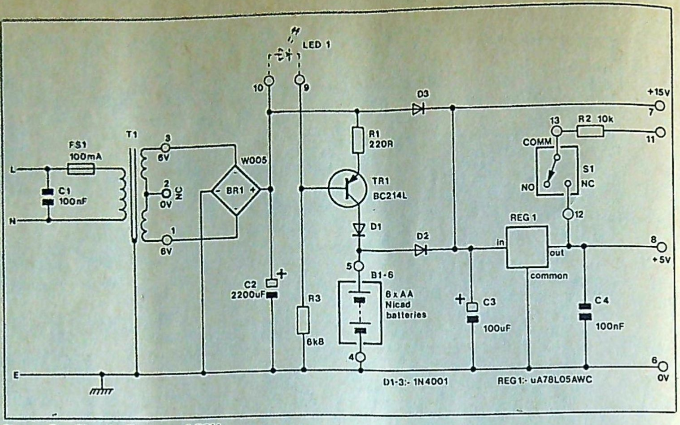


Figure 2. Circuit diagram of PSU.

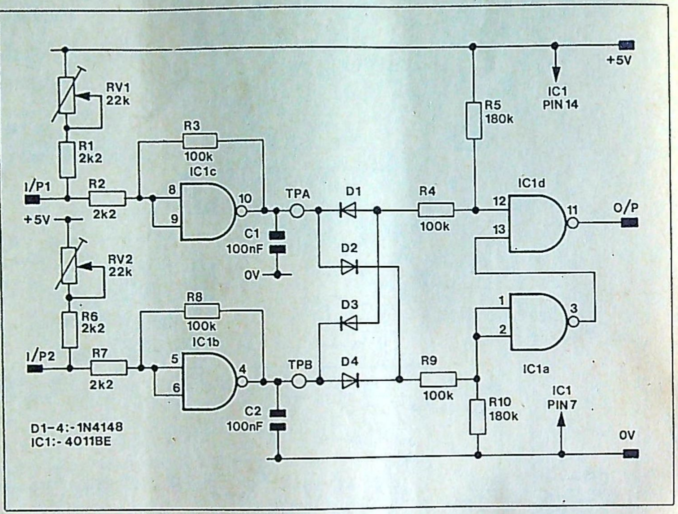


Figure 3. Circuit diagram of Break Contact Module.

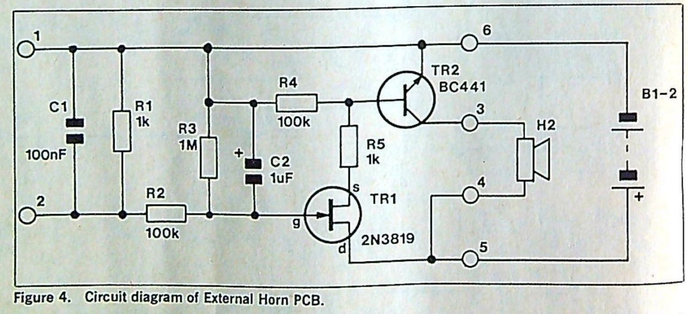


Figure 4. Circuit diagram of External Horn PCB.

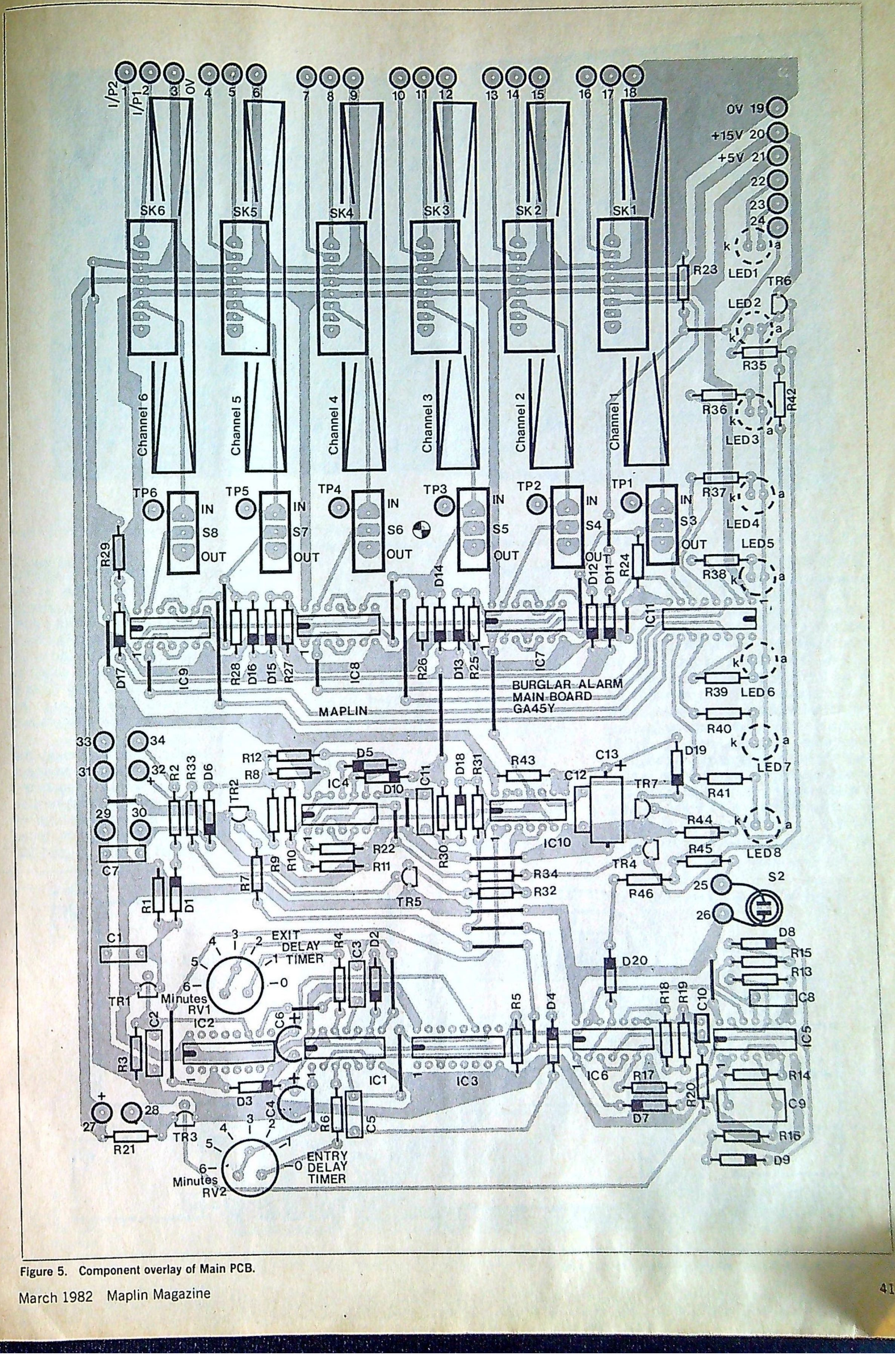
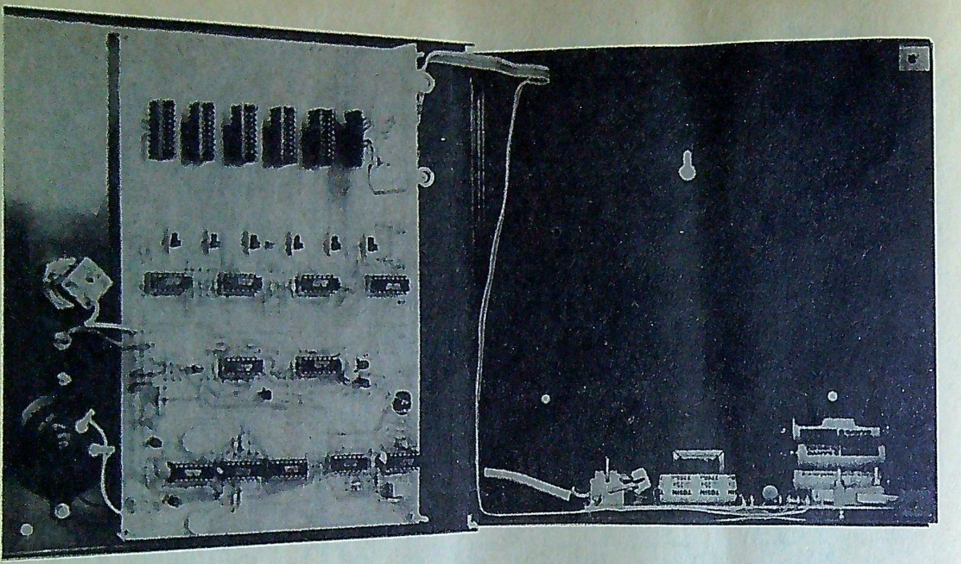


Figure 5. Component overlay of Main PCB.



Pic. A Internal view of control box with Main PCB fitted to the door and the PSU mounted in the base of the box.

Construction

Assembly and Setting Up Main PCB

Refer to the parts list 1 and Figure 10. Use 24 swg BTC (or E/C) wire to make the 28 link straps and fit these first. Next, fit the Veropins and the diodes. (The black tips are shown as white blocks on the legend.) Fit all resistors and capacitors. Note that electrolytic and tantalum types are polarised and have a '+' sign which must be correctly orientated. Fit transistors and IC sockets. Fit the two cermet presets RV1 and 2, and turn fully clockwise, to 0 on the legend. Connect a 1k0 test resistor RT across pins 29 and 30. (Note - this will be removed when using the external horn PCB, but must remain in place if the external PCB is not in use.)

Refer to Figures 11 and 13 when mounting the channel LEDs. LEDs 1 to 8 are mounted to the PCB from the track side. Figure 13 shows the lead designations. Place the correctly orientated LED into position and insert a spacing strip 8mm x 1.5mm (spare Veroboard etc) between the legs. Bend the legs under the PCB, to hold in position and solder one leg only. Repeat for all eight LEDs.

Figure 12 shows the mounting procedure for fitting the PCB to the inside cabinet lid. Place five 1" x 6BA CSK screws through the lid, tighten down with five 6BA nuts and washers. Place five 6BA x ¼" spacers over the screws and offer the PCB to the lid, positioning the channel LEDs in the holes provided. With LEDs correctly positioned, remove the PCB and solder the eight remaining LED legs. Re-check all component values and positionings. Check for dry joints, solder splashes and short circuits on the track face. If all is in order, mount the PCB on to the lid and hold with five 6BA washers and nuts.

Push switch S2 mounts through the PCB and lid and is wired to adjacent pins 25 and 26. Mount LED 9 and connect to pins 31 and 32 (Figure 10). Mount key switch S9 and piezo horn H1 using two ¼" x 6BA CSK nuts, bolts, washers. Wire H1 to pins 27 and 28.

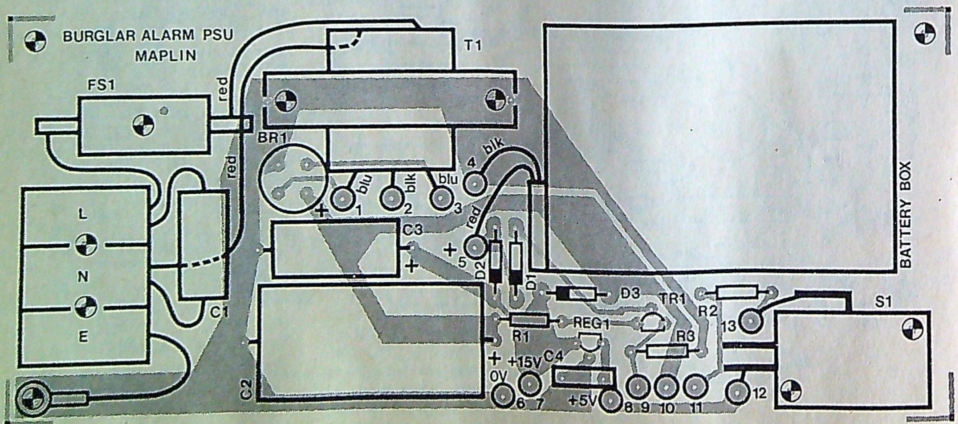


Figure 6. Track layout and component overlay of PSU PCB.

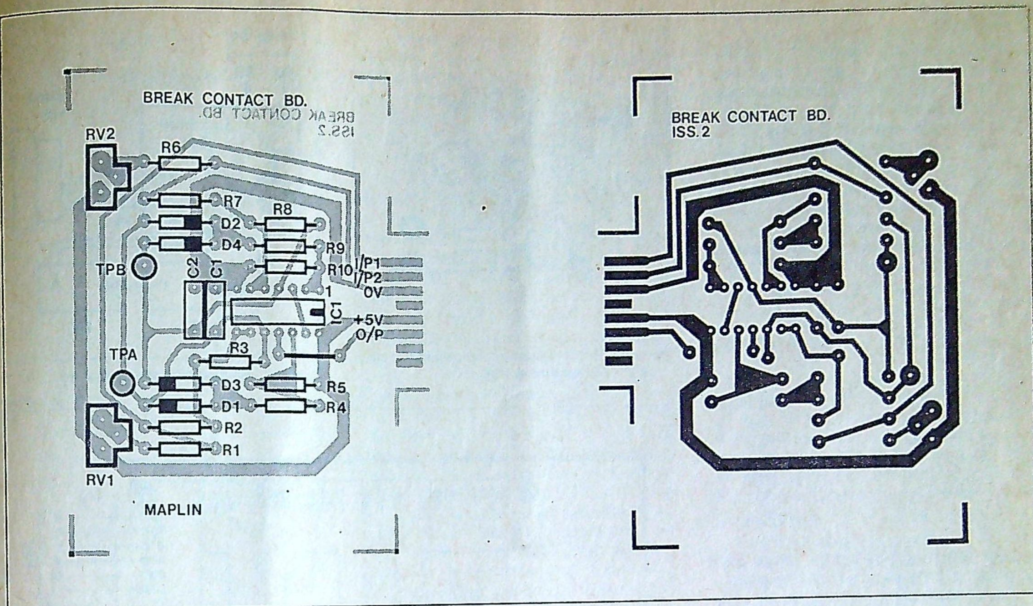


Figure 7. Track layout and component overlay of Break Contact Module.

Power Supply Unit

Next refer to the parts list and Figure 12 and 13 for the PSU assembly. Mount the three resistors, three diodes, BR1, TR1, and REG1. Ensure correct orientation of these components before soldering. Fit the 13 Veropins, C2 and C3 noting the polarity. Mount T1 with two 6BA ¼" bolts, nuts and washers. Mount FS1 using a ¼" x 6BA nut and bolt and three-way terminal block, using two 1" x 6BA bolts, nuts and washers. Wire T1 to FS1 and the terminal block 'N'. Wire the opposite end of FS1 to terminal block 'L'. Place systoflex sleeving over C1 leads, and fit to terminal block 'N' and 'L'. The battery clip (PP3) is connected to pin 5 (+ve lead red) and pin 4 (-ve lead black). The T1 secondaries connect to adjacent pins 1, 2 and 3.

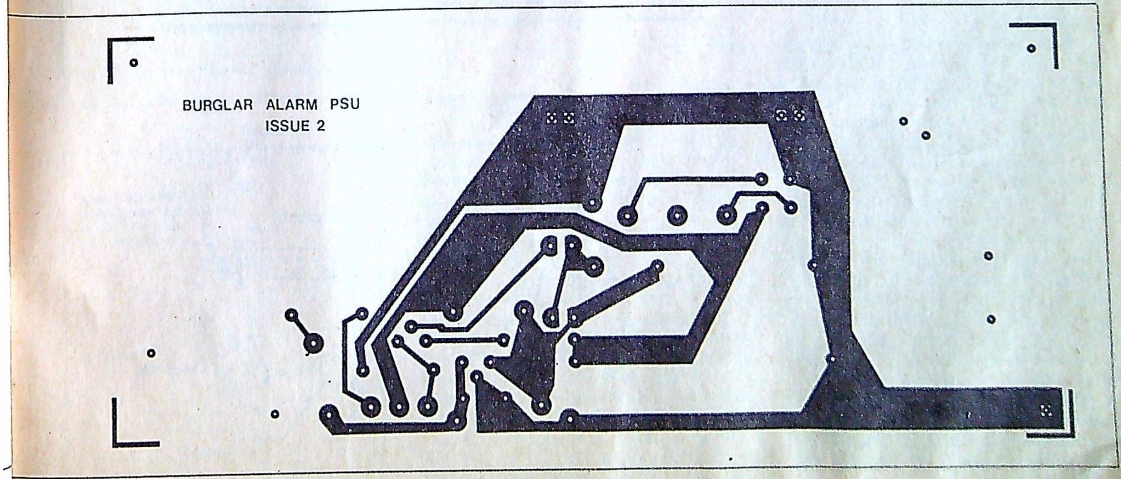
Insert three 6BA x ½" CSK screws through the cabinet base holes (Figure 15), at front left, rear left and rear right hand side. The two front right hand side holes are for mounting the micro switch. Insert two 1" x 6BA CSK screws and tighten all five with 6BA washers and nuts. Place the PSU PCB over the five screws and position the micro switch with the roller arm behind the angle bracket. Tighten down with two 6BA washers and nuts. Place a 6BA tag washer over the front left screw, and two 6BA washers over the remainder. Tighten down with three 6BA nuts. Connect a piece of wire from the 6BA (chassis earth) tag washer to terminal block 'E'. Wire the micro switch (S1) to adjacent pins 12 and 13.

Break Contact Module

Refer to the parts list and Figure 7 for the break contact PCB. The board is very simple to construct and requires no explanation. Once assembled, and checked, plug into any one of the six channel sockets on the main PCB. Ensure switches S3 to S8 are 'out' of circuit.

External Horn

Refer to the parts list and Figures 8, 9 and 17 for the external horn PCB and wiring. Again, the construction is simple. Note the orientation of the tantalum C2 and FET TR1. The crinkly heatsinks fits over TR2. Do not connect to main PCB at this stage.



Testing

Place a 20mm, 100mA fuse into FS1 position. Connect a length of three-way mains cable to the PSU terminal block. Ensure S1 is fully operated, and that no other wiring is connected to the PSU.

Place a voltmeter between 0V pin 6 and +15V pin 7. Apply mains power to the PSU, and check for a reading of 15V DC. Check for +5V between pin 6 (0V) and pin 8 and between 0V and pin 11 when S1 (micro switch) is released (slacken 2BA bolt). Re-operate S1 and check for 0V on meter. Remove the mains supply.

Connect 22" of six-way ribbon cable between the PSU and main PCB as follows:

	PSU	To	Main PCB
(0V)	P6		P19
(+15)	P7		P20
(+5)	P8		P21
LED1	P9		P22
	P10		P23
(S1)	P11		P24

Set the meter to 'amps' range and connect to pins 4 and 5 (or battery clip). Re-apply mains power and check for a reading of approximately 4mA and ensure LED 1 lights up. Remove the meter and LED 1 should extinguish. If the standby batteries are to be used, connect the nicad pack to the PP3 clip.

A voltmeter connected across pins 4 and 5 should indicate a reading of between 7.2 to 7.8V depending on the batteries state of charge. Note that LED1 will stay on with the batteries part or fully charged, also an incorrectly placed battery, within the pack, will allow LED1 to stay on, but the reading across pins 4 and 5 will be lower than +7V. (Rectify immediately as nicads do not like short circuits or reversed connections placed on them.)

For reliability, ensure that the battery pack is fully charged before use. The trickle charger keeps them topped up over a period of time and is not a fast charger.

Main PCB

With power on, and keyswitch disarmed, LED1 only should be on, and no alarm tones heard. Ensure RV1 and 2 are both fully clockwise, and turn key to 'set'. A high pitched tone will sound immediately lasting for no more than two seconds. When the tone stops, LED9 ('ARM') comes on, showing that the alarm is now primed and ready. Note that the warble tone, sounds for the duration of the exit timer delay period and is presettable by adjusting RV1 anticlockwise. The PCB legend has 'scaled' from 0 to 6 minutes and the small circle, on top of the cermet pot, acts as a pointer. If the exact time out periods are required, check the calibration scale with a watch or clock.

Once LED9 has come on, further adjustment of RV1 will only be effective when the key is turned to 'disarm' and then back to 'set', starting the exit timer again.

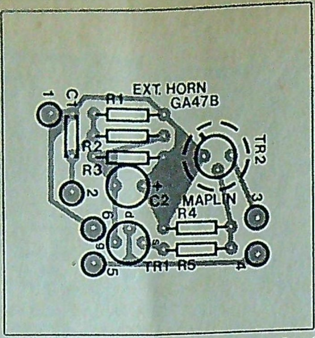


Figure 8. Track layout and component overlay of External Horn PCB.

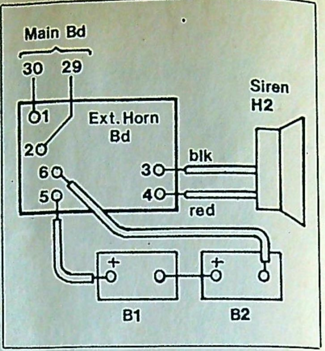


Figure 9. External Horn wiring diagram.

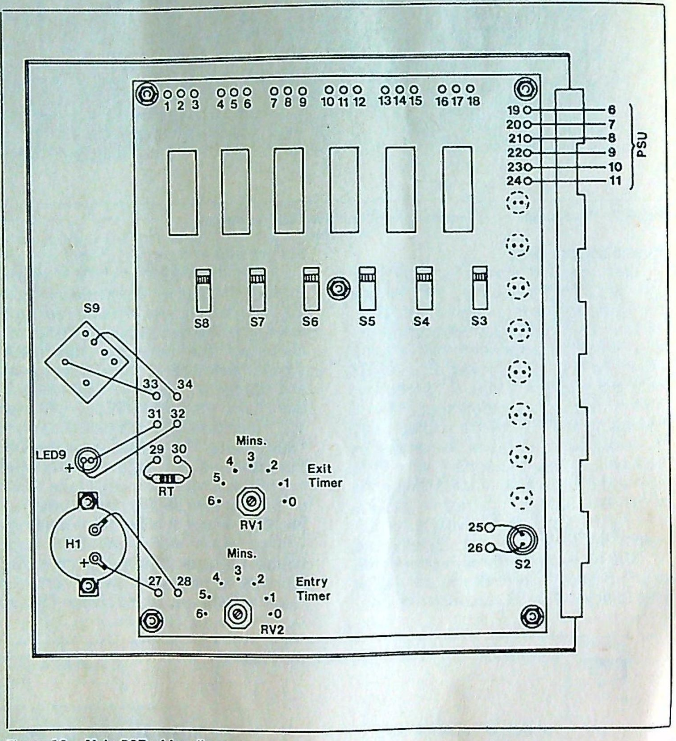


Figure 10. Main PCB wiring diagram.

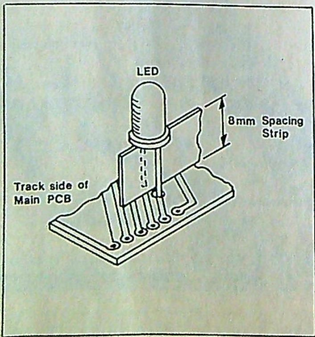


Figure 11. Indicator LED mounting.

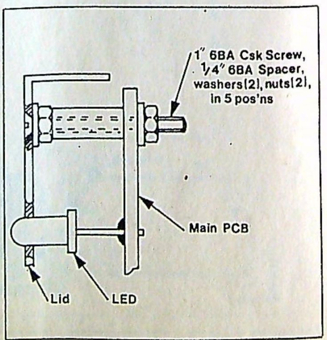


Figure 12. Mounting of Main PCB to cabinet door.

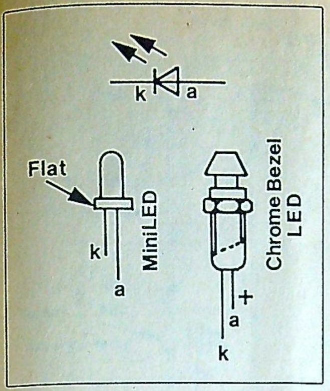


Figure 13. LED lead outs.

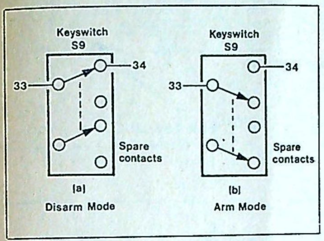


Figure 14. Key switch wiring.

Points

Connect a length of wire from P21 (+5V) to test point 1 (TP1). Operate S3 to the "IN" position. Press S2, display on and release. Channel 1 LED 3 will come on. Place S3 to the "OUT" position. LED 3 will go out. Repeat the above tests from +5V to TP2 to 6 and S4 to 8 checking channel LEDs 4 to 8. Note that pressing S2 allows the channel LEDs to light up, once triggered, for approximately 90 seconds. S2 will have to be re-operated for a continued display etc.

Remove the test lead from the test point, but leave attached to +5V. Turn the key switch to "set". Once the "armed" LED has come on, place switches S3 to S8 to the "IN" position (note — remove any plug-in PCBs). Check that no tone is heard and that LEDs 1 and 9 only are on. Touch the +5V test lead to test points 1 to 6 in turn, all channel LEDs should come on, followed by a slow, two-tone alarm signal. Ext/Cab alarm, LED 2, will come on, indicating tht the external horn trigger circuit has been operated. This alarm tone continues until the key switch is set to "dis-arm". Leave the alarm sounding and check that after 90 seconds the display goes off (preserving batteries on standby). The alarm tone should still continue. Press S2, check original display is returned.

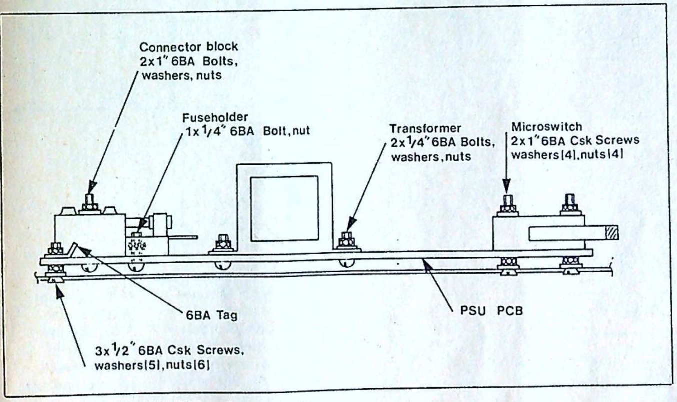


Figure 15. Mounting PSU PCB and components.

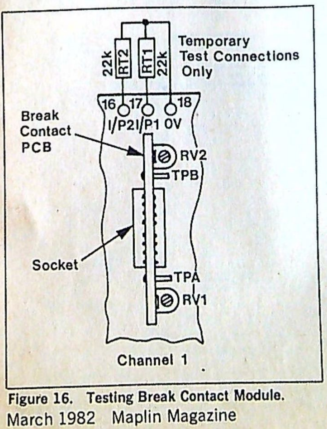


Figure 16. Testing Break Contact Module.

Circuit Monitor

Turn the key switch to "dis-arm". The tone and all displays will be cancelled. Note that in the dis-arm mode and with S2 pressed, the unit gives a useful monitor facility of doors, windows etc, which can be checked before arming the system. Loosen the 2BA bolt holding off micro switch S1. Ensure the roller arm releases, and turn the key switch to "set". After the time out period and LED 9 has come on, the Ext/Cab alarm LED 2 will light, showing that the cabinet has been tampered with, and the alarm tone will sound. Reset the key switch to "dis-arm". The alarm tone will cancel, but LED 2 will remain on for 90 secs; display time out. Re-operate S1 by tightening the 2BA bolt and LED 2 will go out.

Ext. Alarm

Place a short circuit across test resistor RT (1k0) between pins 29 and 30. Press S2, LED 2 will light, indicating that the external loop sensing circuit has been tampered with. Remove the short circuit; LED 2 will go out. Remove one end of resistor RT and press S2. LED 2 will, again, come on. Re-connect RT and LED 2 should go out.

Turn the key switch to "set" and replace the short circuit across resistor RT. When the alarm sounds, remove the short circuit. LED 2 will stay on and the alarm will continue to sound. Return key switch to "dis-arm".

Power Failure

Note that if standby batteries are fitted and mains power is removed, LED 1 will go out. If the alarm unit is set and armed prior to removal of mains power, the system will stay armed, unless triggered appropriately. When running on standby power, the alarm tones will be slightly quieter than normal.

Entry Timer

Set RV2, entry delay timer, for the required time out period. Turn the key switch to "set" and trigger any channel (+5V to a test point). The selected channel LED should come on and stay on. The alarm tone will not be present until the time out period has been reached, then the alarm tone will sound and LED 2 will light. Reset the key switch.

Break Contact PCB

This module may be plugged into any of the sockets in channels 1 to 6 on the main PCB. Note correct orientation of the module, when fitting; the component side is to the right and the track side, to the left.

Remove *all* power to the system, turn the key switch to "dis-arm" and S3 to S8 to the "OUT" position. Connect two test resistors, RT1 and RT2 (22k) between pins 17 and 18 and pins 16 and 18, as shown in Figure 16. These resistors are used for test purposes only and will be removed when the circuit is to be used.

Connect a voltmeter between TPA, on the module, and a convenient 0V point, with the +ve lead to TPA. Apply power to the system, and adjust RV1 for a reading of half the supply rail, i.e. +2.5V.

Repeat the test on TPB using RV2, and remove meter. Re-connect the meter between 0V and TP1 to 6 (main PCB) depending on channel chosen for setting up the module, and check for 0V. Short circuit resistor RT1, and check for +5V on the appropriate test point (main PCB). Remove the short circuit and repeat the test for RT2. Set the chosen channel switch (S3 to S8) to the "IN" position. Turn the key switch to "set" and remove one end of RT1. The appropriate channel LED will come on etc. Re-connect RT1; reset the key switch and repeat the test for RT2.

Reset the key switch and remove test resistors RT1 and 2.

External Horn PCB

Figures 8 and 9 show the connections for using an external horn. For test purposes remove *all* power from the system (disconnect all batteries) and wire the PCB to pins 29 and 30 (remove resistor RT). Any changes made to these connections will trigger the alarm so ensure correct wiring. Connect the electronic siren to pins 3 and 4; the black lead is negative and the red +ve. Since the siren is inside a box, its own cover is not required and should be removed to assist wiring and make the sound output as great as possible. Connect batteries B1 and B2 to pin 5 (+ve) and 6 (-ve). The battery supply should be 12V and various types of dry cell (6V each) are available. Note that no charging current is available to these batteries.

The horn (H2) will sound immediately, so return power to the alarm unit as soon as possible. Place a short circuit across pins 29 and 30 (main PCB); H2 will sound. Remove the short circuit and H2 will cease.

Turn the key switch to "set" and repeat the test. Both internal and

Continued on Page 59

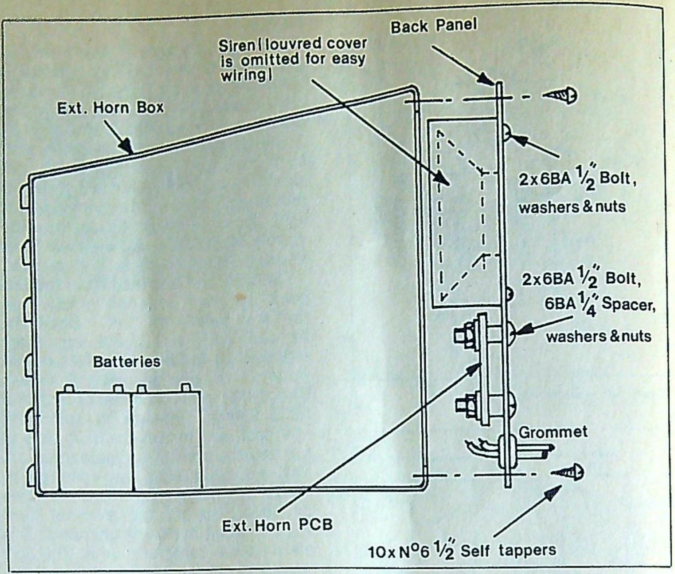

Back Panel
Siren (louvred cover is omitted for easy wiring)
Ext. Horn Box
2x6BA 1/2" Bolt, washers & nuts
2x6BA 1/2" Bolt, 6BA 1/4" Spacer, washers & nuts
Batteries
Grommet
Ext. Horn PCB
10 x N°6 1/2" Self tappers

Figure 17. Assembly of External Horn Box.

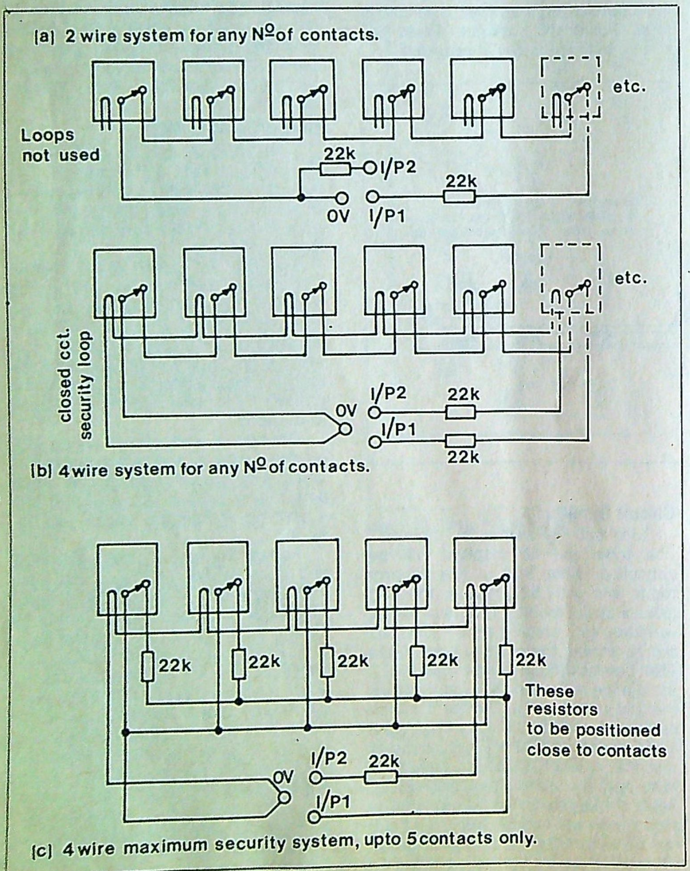

(a) 2 wire system for any N° of contacts.
etc.
Loops not used
22k
I/P2
22k
0V
I/P1
etc.
closed cct. security loop
I/P2
22k
0V
I/P1
22k
(b) 4 wire system for any N° of contacts.
22k
22k
22k
22k
22k
These resistors to be positioned close to contacts
I/P2
22k
0V
I/P1
(c) 4 wire maximum security system, upto 5 contacts only.

Figure 18. *Methods of wiring alarm contacts.*

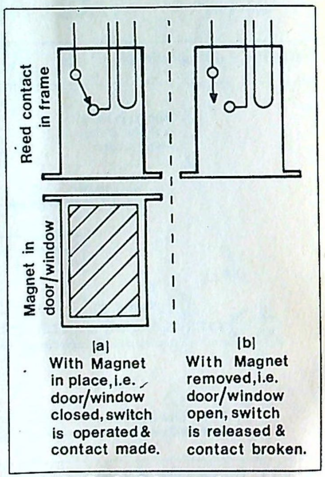

Reed contact in frame
Magnet in door/window
(a) With Magnet in place, i.e. door/window closed, switch is operated & contact made.
(b) With Magnet removed, i.e. door/window open, switch is released & contact broken.

Figure 19. Reed switch connections.

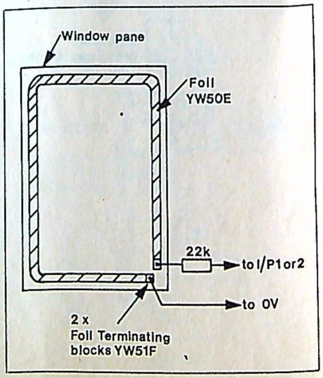


Figure 20. Window foil connections.

BURGLAR ALARM MAIN PARTS LIST

Resistors — all ⅓W 5% carbon unless specified

R1,2,12,22-29	100k	11 off	(M100K)
R3,5,7,17,18, 20,32,42	10k	8 off	(M10K)
R4,6,21,33,35-41	1k	11 off	(M1K)
R8	470R		(M470R)
R9	220R		(M220R)
R11	120k		(M120K)
R13,14,31	1M	3 off	(M1M)
R15	68k		(M68K)
R16	22k		(M22K)
R19,30	470k	2 off	(M470K)
R10,34	47k	2 off	(M47K)
R43	1M2 10%		(M1M2)
R44	1k2		(M1K2)
R45,46	3k9	2 off	(M3K9)
RT (test resistor)	1k		(M1K)
RV1,2	1M cermet	2 off	(WR45Y)

Capacitors

C1,2,7,11,12	100nF disc ceramic	5 off	(BX03D)
C3,5	27nF polycarbonate	2 off	(WW34M)
C4,6	1uF 35V tantalum	2 off	(WW60Q)
C8	82nF polycarbonate		(WW40T)
C9	820nF polycarbonate		(WW52G)
C10	330pF ceramic		(WX62S)
C13	47uF 10V axial electrolytic		(FB38R)

Semiconductors

D1-20	1N4148	20 off	(QL80B)
TR1,5	BC214L	2 off	(QB62S)
TR2,3,4,6,7	BC548	5 off	(QB73Q)
IC1,4-10	4001BE	8 off	(QX01B)
IC2,3	4020BE	2 off	(QX11M)
IC11	4050BE		(QX22Y)

Miscellaneous

LED 1-8	Mini LED red	8 off	(WL32K)
LED 9	Chrome LED small		(YY59P)
S2	HQ push switch		(YR67X)
S3-8	SP slide switch	6 off	(FF77J)
S9	Keyswitch		(FH40T)
H1	Piezo horn		(YW52G)
SK1-6	8-way edge connector	6 off	(FL83E)
	Burglar alarm main PCB		(GA45Y)
	6BA x 1" csk screw	5 off	(BF13P)
	6BA washer	12 off	(BF22Y)
	6BA nut	12 off	(BF18U)
	6BA x ¼" spacer	5 off	(FW34M)
	6BA x ½" csk screw	2 off	(BF12N)
	2BA x 1" bolt	2 off	(BF01B)
	Grommet small	2 off	(FW59P)
	Burglar alarm box		(XG06G)
	Veropin 2141	40 off	(FL21X)
	Ribbon cable 10-way	1M	(XR06G)
	14-pin DIL skt	8 off	(BL18U)
	16-pin DIL skt	3 off	(BL19V)

As required

	Door contact reed		(YW46A)
	Window foil		(YW50E)
	Window foil terminals		(YW51F)
	Surface mounting reed		(YW47B)
	Door loop		(YW48C)
	Pressure mat		(YB91Y)

For kit see under PSU parts list

BURGLAR ALARM PSU PARTS LIST

Resistors — all ⅓W 5% carbon unless specified

R1	220R		(M220R)
R2	10k		(M10K)
R3	6k8		(M6K8)

Capacitors

C1	100nF suppression capacitor		(FF56L)
C2	2200uF 25V axial electrolytic		(FB90X)
C3	100uF 25V axial electrolytic		(FB49D)
C4	100nF disc ceramic		(BX03D)

Semiconductors

D1,2,3	1N4001	3 off	(QL73Q)
BR1	W005		(QL37S)
Reg 1	uA78L05AWC		(QL26D)
TR1	BC214L		(QB62S)

Miscellaneous

T1	Transformer 6-0-6 100mA		(WB00A)
S1	Microswitch		(FH95D)
FS1	20mm Fuse 100mA		(WR00A)
	Chassis Fuseholder		(RX49D)
	Terminal block 5A (3 sections)		(HF01B)
	Burglar Alarm PSU PCB		(GA44X)
	6BA TAG		(BF29G)
	6BA x 1" bolt	2 off	(BF07H)
	6BA x ¼" bolt	3 off	(BF05F)
	6BA x 1" csk screw	2 off	(BF13P)
	6BA x ½" csk screw	3 off	(BF12N)
	6BA washer	13 off	(BF22Y)
	6BA nut	15 off	(BF18U)
	Insulated sleeving	3"	(BF87U)
	Veropin 2141	13 off	(FL21X)

Standby Power if required

B1-6	Nicad 'AA' cells	6 off	(YG00A)
	Battery box		(HQ01B)
	Battery clip		(HF28F)

A complete kit is available which includes all the parts in the PSU parts list (including standby power parts) and all the parts in the main parts list excluding those listed under "As required".
Order As LW57M (Burglar Alarm Kit) Price £44.95.

EXTERNAL HORN PARTS LIST

Resistors — all ⅓W 5% carbon unless specified

R1,5	1k0	2 off	(M1K0)
R2,4	100k	2 off	(M100K)
R3	1M0		(M1M0)

Capacitors

C1	100nF disc ceramic		(BX03D)
C2	1uF 35V tantalum		(WW60Q)

Semiconductors

TR1	2N3819		(QR36P)
TR2	BC441		(QB70M)

Miscellaneous

H2	Electronic siren		(XG14Q)
B1,2	6V lantern battery	2 off	
	Heatsink 5F		(FL78K)
	PCB		(GA47B)
	Veropins 2141	6 off	(FL21X)
	Case		(XG07H)
	Grommet small		(FW59P)
	Screws self tapping No 6 ½ inch	10 off	(BF67X)
	Bolts 6BA ½ inch	4 off	(BF06G)
	Washers 6BA	4 off	(BF22Y)
	Nuts 6BA	4 off	(BF18U)
	Spacers 6BA ¼ inch	2 off	(FW34M)

A complete kit of all the parts listed above (excluding batteries) is available.
Order As LW58N (External Horn Kit) Price £29.95

BREAK CONTACT MODULE PARTS LIST

Resistors — all ⅓W 5% carbon unless specified

R1,2,6,7	2k2	4 off	(M2K2)
R3,4,8,9	100k	4 off	(M100K)
R5,10	180k	2 off	(M180K)
RT1,2 (test resist.)	22k	2 off	(M22K)
RV1,2	22k vert-sub min preset	2 off	(WR72P)

Capacitors

C1,2	100nF disc ceramic	2 off	(BX03D)

Semiconductors

D1-4	1N4148	4 off	(QL80B)
IC1	4011BE		(QX05F)

Miscellaneous

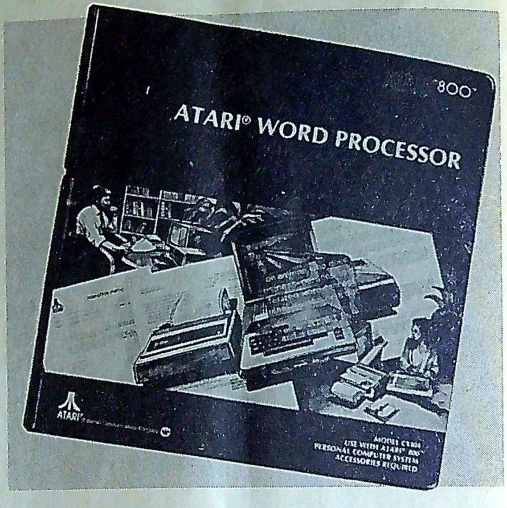
TPA,B	Veropin 2141	2 off	(FL21X)
	Break contact PCB		(GA46A)
	14-pin DIL skt		(BL18U)

A complete kit of parts is available.
Order As LW59P (Break Contact Kit) Price £2.99

ATARI COMPUTER NEWS

by Graham Daubney

Details this month of the amazing Atari Word Processor software package that includes its own training programme! and a review of an excellent new game you can really get your teeth into: Jawbreaker. Also this time a morse tutor program that will greatly help all CB breakers to move onto finer and farther things - there's nowhere in the world you can't talk to once you've got an amateur radio licence with morse code.



ATARI WORDPROCESSOR SYSTEM

This wordprocessor requires the following hardware:
ATARI 800 Personal computer system
ATARI 810 Disk Drive
ATARI 850 Interface module
ATARI PRINTER
TV set or Monitor

The package consists of an extremely large training manual, master diskette, data diskette, backup master diskette and to cap it all a training cassette.

The documentation supplied is both extensive and comprehensive and takes the form of lessons. Add to this the training cassette and anyone of medium intelligence supplied with this lot can learn to process words in a very short time indeed, though as will become apparent during this review, to completely master the many functions provided would take perhaps a few weeks.

The opening lesson assumes absolutely no knowledge of either word processing or computer systems and is a step by step guide of how to back up your data diskettes and how to load and get running the software provided. The basic cursor controls are then explained in some detail followed by how to enter text and then save your document onto disk. A brief description of how to print out your text is also given, this means that anyone who is familiar with both computers and wordprocessing can at least get started.

Lesson two covers moving the viewing window (this is necessary as the screen acts as a window onto a portion of your document and you can move this window around to examine various parts), deleting words and lines or parts of lines, using the page layout control display and text formatting.

Lesson three explains how to paginate, search-for and replace specific words, delete text and movement of a block of text. At this point you use one of the pieces of text supplied on the data disk.

Lesson four covers text alignment, centering of text, setting and use of tabs and text justification when printing out.

Lesson five deals with repagination, removal of headers, renaming of documents and use of the disk utilities.

The last lesson deals with some of the trickier functions, i.e. entering of subscripts and superscripts, creation of text in elongated print, alignment of columns of figures, positioning text outside the set margin, addressing of envelopes and printing in double column format.

The wordprocessor is based on a system of menus, each offers a list of choices, many menus lead to sub menus, I found this system very easy to get used to especially as it is possible to page back through the menus using the escape key until you find the function that you are looking for. The top of the screen is separated from the work area by a blank line in which there is a cursor. I found this cursor confusing at first and wondered why it was there at all, as you have no control over it, however it does fly about within the dividing line when the machine is performing certain functions and so I assume its presence is merely to tell you that something is happening. Right at the top of the screen is the status line which gives you useful information about the document that you are working on, i.e. its name, which page you are working on, the current cursor column.

The quantity of control codes used to perform editing and formatting functions is huge and this is one area where the beginner may flounder at first. I got to grips with the more commonly used ones within an hour or two and some of the less common ones come with practice. It seems that ATARI have thought of just about anything you could possibly wish to do with a document and the control codes and their functions are reprinted here for your examination.

Print formatting is selected by hitting the select key, which will present you with a graphical representation of your text on a page and also a

Control Character Summary

Centering Text
CTAL V Center line of text

Saving Blocks of Text
CTAL N Mark the beginning of text
CTAL M Mark the end of text
CTAL S Save text block

Insert Saved Text Block
SHIFT INSERT Insert saved text block (position cursor at point of insertion)

Delete Text Block
CTAL N Mark the beginning of text
CTAL M Mark the end of text
SHIFT CLEAR Delete text block
NOTE: Saving, inserting, and deleting blocks of text can also be done in Text Memory mode of the Extended Functions menu.

Changing Character Case
CTAL C Change character from lower case to upper case and vice versa

Underlining
CTAL I Change character from normal to underlined and vice versa. Inverse video characters on the screen display represent underlined characters during printout

Subscripts and Superscripts
CTAL INSERT CTAL ↓ Subscripts (half line down)
CTAL INSERT CTAL ↑ Superscripts (half line up)

Elongated Print
Text to be printed with elongated characters must be bracketed by special characters. Both CTAL and INSERT keys must be pressed at the same time and released before the next key is pressed.
CTAL INSERT then TAB Start elongated print
CTAL INSERT then DELETE BACK S Stop elongated print

Line Terminators
RETURN Insert fixed line terminator. Line will be formatted (indented, line spacing, paragraph spacing, margin alignment, etc.)
CTAL J Insert fixed line terminator. Line will not be formatted

Page Break
CTAL K Automatically breaks page during pagination

Cursor Movement
CTAL ← One space left
CTAL → One space right
CTAL ↑ One space up
CTAL ↓ One space down

Quick Cursor Movement
CTAL A Beginning of line
CTAL E End of line
CTAL G Left Margin
CTAL H Right Margin
CTAL I Top of page
CTAL B Bottom of page
CTAL : End of text

Window Movement
CTAL TAB Fast scroll left
SHIFT TAB Fast scroll right
CTAL V Fast scroll up
CTAL O Fast scroll down
CTAL L Viewing window left
CTAL R Viewing window right
CTAL U Viewing window up
CTAL D Viewing window down

Deleting Characters
DELETE BACK S Delete character to left of cursor
SHIFT DELETE BACK S Delete character to right of cursor

Deleting Words Or Lines
CTAL W Delete current word (word over cursor)
CTAL P Delete prior word (word prior to cursor)
CTAL DELETE BACK S Delete from cursor to beginning of line
CTAL F Delete from cursor to end of line
CTAL X Delete entire line
CTAL Z Restores edited line to its original state

Inserting Characters, Words, Or Lines
To insert characters or words, position the cursor at the point of insertion and begin typing.
CTAL J Insert blank line (terminated but not formatted)
CTAL O Insert blank line (formatted but not terminated)
RETURN Insert blank line (formatted and terminated)

Margin Alignment
CTAL [Align line to left margin
CTAL] Align line to right margin

menu of alterable functions, again this menu is very comprehensive and allows you to format your text very effectively. The following functions can be adjusted from this menu: top, left and right margins, line, paragraph and indentation spacing, page size, justification (on or off), characters per inch and tabs.

All data storage is on a standard 5¼ floppy diskette which can hold up to 63 pages of text, obviously this is dependent on the size of your pages. As you have the ability to work on one document a page at a time it is possible to store one document split into pages and spread over a number of diskettes so for all practical purposes you can work on a document of any size. In practice I found the storage more than adequate for my purposes which consist mostly of standard letters or at least paragraphs, memos (mostly to myself!) and writing of leaflets or reviews, in fact this review was written using this processor although it has of course been type set and printed since. If anyone wishes to see the original of this article as produced straight from the ATARI system I will of course be pleased to provide one if you write to me with a self addressed envelope.

To date the software has not crashed on me or given any strange results and I have found it to be very user friendly with descriptive error messages that soon put you back on the right track. In fact, during use there are a number of safety features built into the software. For instance it is impossible to overwrite the text you are working on accidentally so you are asked to confirm that it is O.K. before the machine goes ahead.

In conclusion, this word processor is powerful and has many features and functions not found on packages costing up to 3 times as much. As price is obviously a prime consideration for a small business the cost of the hardware necessary to implement this package ensures that this is the cheapest way to get your secretary automated.

I particularly liked the training cassette idea and feel sure that this idea will be mimicked by software producers in the future. The documentation, as stated earlier, is superb to learn from although once the basics had been digested I found it a little difficult to find an explanation of specific functions quickly although the idea of a removable plastic covered 'crib sheet' helped later on.

The complete Atari Word Processor software package is available now.

Order As YG42V (Word Processor) Price £85.00.

MORSE TUTOR PROGRAM FOR ATARI

by Chris Barlow

Morse code was developed for use in electric telegraphy in 1838 by Samuel F. B. Morse.

The earliest Transatlantic radio signal was received by Marconi at Poldhu, Cornwall, from a 10kW transmitter at Newfoundland, Canada, on the 12th December 1901. The highest speed ever recorded for receiving morse code is 75.2 words per minute and 175 w.p.m. for sending by hand.

Morse transmissions can be received on various short wave bands, amateur radio and shipping signals etc. These morse signals can be between 8 to 14 w.p.m. or even greater speeds.

This program generates randon morse characters, letters and/or numbers at 5 to 30 w.p.m. You can control the delay between morse characters and the tone (pitch).

C. W. signal sets the strength of the morse received, 5/9 a strong signal to 5/1 a weak signal. As the morse gets weaker then more interference is heard on the received signal.

Tutor length sets the number of morse characters generated from 10 to 430 but you can stop at anytime by pressing the option key.

At the conclusion of generated morse, an end bleep will sound and you may then read the screen to check your accuracy.

You may then use the start key to repeat the exercise or press select key for the setup menu.

When the program is running use option/select/start keys to control the program and here is a brief description of the working program.

MORSE TUTOR PROGRAM

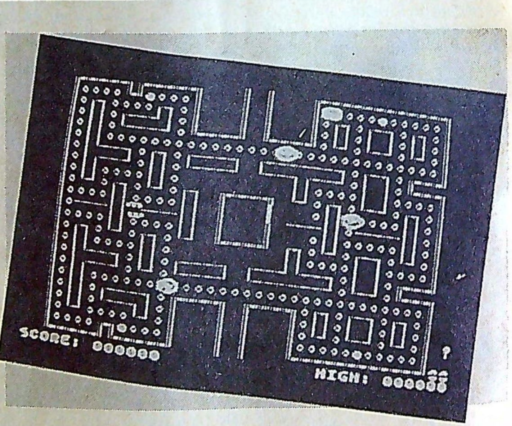
1000 to 1540 read random line of data.
1550 and 1560 C.W. tone and Q.R.M. sound
1600 print morse characters and delay/length routine.
1700 to 1760 end of morse and setcolour to read screen.
2000 to 2035 morse data dit dah and space. Last number is character string value.
2500 and 2510 setup routine for tone and speed etc.
3000 to 3140 print graphics page 2 the menu/setup.
3150 to 3525 select/start routines tone speed etc.
4000 to 4230 print graphics page 1 the morse code.
5000 start morse sounds routine.
The complete program is shown below.

```
20 GOSUB 2500
1000 A=INT(RND(1)*TYPE)
1005 IF TYPE>10 AND A<10 AND MIXED=0 THEN 1000
1010 IF PEEK(53279)=3 THEN 1700
1040 RESTORE A+2000
1500 READ B
1510 IF B=1 THEN C=TONE:X=1
1520 IF B=2 THEN C=TONE:X=3
1530 IF B=3 THEN C=0:X=1
1540 IF B>3 THEN C=0:X=3
1550 SOUND 0,C,10,SIGNAL:SOUND 1,17,8,QRM:SOUND 2,1,4,QRM:SOUND 3,10,10,QRM
1560 FOR T=0 TO X*RATE:NEXT T
1570 IF B>3 THEN 1600
1580 GOTO 1500
1600 POKE 77,0:PRINT CHR$(B);":";:FOR T=0 TO DELAY*360:NEXT T:LENGTH=LENGTH+1:IF
 LENGTH=TIME THEN 1700
1610 GOTO 1000
1700 SOUND 1,0,0,0:SOUND 2,0,0,0:SOUND 3,0,0,0:SETCOLOR 1,0,10:SETCOLOR 2,7,0
1710 FOR T=0 TO 10:SOUND 0,70,10,5:SOUND 1,71,10,5:SOUND 2,72,10,5:SOUND 3,73,10
,5
1720 FOR C=0 TO 30:NEXT C:SOUND 0,0,0,0:SOUND 1,0,0,0:SOUND 2,0,0,0:SOUND 3,0,0,
0
1730 FOR C=0 TO 30:NEXT C:NEXT T
1740 IF PEEK(53279)=5 THEN GOSUB 3000
1745 IF PEEK(53279)=6 THEN GOSUB 5000
1750 IF LENGTH=0 THEN 1000
1760 GOTO 1740
2000 DATA 2,3,2,3,2,3,2,3,2,48
2001 DATA 1,3,2,3,2,3,2,3,2,49
2002 DATA 1,3,1,3,2,3,2,3,2,50
2003 DATA 1,3,1,3,1,3,2,3,2,51
2004 DATA 1,3,1,3,1,3,1,3,2,52
2005 DATA 1,3,1,3,1,3,1,3,1,53
2006 DATA 2,3,1,3,1,3,1,3,1,54
2007 DATA 2,3,2,3,1,3,1,3,1,55
2008 DATA 2,3,2,3,2,3,1,3,1,56
2009 DATA 2,3,2,3,2,3,2,3,1,57
2010 DATA 1,3,2,65
2011 DATA 2,3,1,3,1,3,1,66
2012 DATA 2,3,1,3,2,3,1,67
2013 DATA 2,3,1,3,1,68
2014 DATA 1,69
2015 DATA 1,3,1,3,2,3,1,70
2016 DATA 2,3,2,3,1,71
2017 DATA 1,3,1,3,1,3,1,72
2018 DATA 1,3,1,73
2019 DATA 1,3,2,3,2,3,2,74
2020 DATA 2,3,1,3,2,75
2021 DATA 1,3,2,3,1,3,1,76
2022 DATA 2,3,2,77
2023 DATA 2,3,1,78
2024 DATA 2,3,2,3,2,79
2025 DATA 1,3,2,3,2,3,1,80
2026 DATA 2,3,2,3,1,3,2,81
2027 DATA 1,3,2,3,1,82
2028 DATA 1,3,1,3,1,83
2029 DATA 2,84
2030 DATA 1,3,1,3,2,85
2031 DATA 1,3,1,3,1,3,2,86
2032 DATA 1,3,2,3,2,87
2033 DATA 2,3,1,3,1,3,2,88
2034 DATA 2,3,1,3,2,3,2,89
2035 DATA 2,3,2,3,1,3,1,90
2500 SIGNAL=10:QRM=0:DELAY=0:TONE=10:SPEED=12:TYPE=36:TIME=30:CODE=0:CAL=100:RX=
9:CHL=1:CHN=1
2510 RATE=INT(CAL/SPEED*2)
3000 REM ******MENU*******
3010 GRAPHICS 2+16:SETCOLOR 4,7,1:SETCOLOR 0,4,8
3020 FOR D=0 TO 19:POSITION D,0:PRINT #6;"*":NEXT D
3030 FOR D=0 TO 19:POSITION D,10:PRINT #6;"*":NEXT D
3040 FOR D=0 TO 9:POSITION 0,D:PRINT #6;"*":NEXT D
3050 FOR D=0 TO 9:POSITION 19,D:PRINT #6;"*":NEXT D
3060 POSITION 1,1:PRINT #6;"THE CODE....... ?"
3062 IF CODE=1 THEN POSITION 14,1:PRINT #6;"YES"
3065 IF CODE=0 THEN POSITION 14,1:PRINT #6;"NO."
3070 POSITION 1,2:PRINT #6;"SPEED(WPM)...";SPEED;". ?"
3072 IF SPEED<10 THEN POSITION 15,2:PRINT #6;".. ?"
3080 POSITION 1,3:PRINT #6;"DELAY(SEC)...";DELAY;" ?"
3085 IF DELAY=INT(DELAY) THEN POSITION 15,3:PRINT #6;".0 ?"
3090 POSITION 1,4:PRINT #6;"C.W.TONE.....";TONE;". ?"
3100 POSITION 1,5:PRINT #6;"C.W.SIGNAL...5/";RX;" ?"
3110 POSITION 1,6:PRINT #6;"C.W.LETTERS..... ?"
3112 IF CWL=1 THEN POSITION 14,6:PRINT #6;"YES"
```

```
3115 IF CWL=0 THEN POSITION 14,6:PRINT #6;"NO."
3120 POSITION 1,7:PRINT #6;"C.W.NUMBERS..... ?"
3122 IF CWN=1 THEN POSITION 14,7:PRINT #6;"YES"
3125 IF CWN=0 THEN POSITION 14,7:PRINT #6;"NO."
3130 POSITION 1,8:PRINT #6;"TUTOR LENGTH.";TIME
3132 IF TIME<100 THEN POSITION 16,8:PRINT #6;". ?"
3135 IF TIME>99 THEN POSITION 17,8:PRINT #6;" ?"
3140 POSITION 1,9:PRINT #6;"USE SELECT/START ?"
3150 REM xxxxxxSELECT/STARTxxxxxxxxxx
3155 POSITION 17,1:PRINT #6;"<"
3160 IF PEEK(53279)=5 AND CODE=1 THEN CODE=0:POSITION 14,1:PRINT #6;"NO.":SOUND
0,150,10,5:FOR I=0 TO 30:NEXT I
3165 IF PEEK(53279)=5 AND CODE=0 THEN CODE=1:POSITION 14,1:PRINT #6;"YES":SOUND
0,20,10,5:FOR I=0 TO 30:NEXT I
3166 SOUND 0,0,0,0
3170 IF PEEK(53279)=6 AND CODE=1 THEN 4000
3175 IF PEEK(53279)=6 AND CODE=0 THEN POSITION 17,1:PRINT #6;" ":SOUND 0,30,10,5
:FOR I=0 TO 30:NEXT I:GOTO 3185
3180 GOTO 3160
3185 SOUND 0,0,0,0:POSITION 17,2:PRINT #6;"<"
3190 IF PEEK(53279)=5 THEN SOUND 0,20,10,5:GOSUB 3210
3195 IF PEEK(53279)=6 THEN Z=Z+1:IF Z>10 THEN 3220
3200 GOTO 3190
3210 SPEED=SPEED+1:IF SPEED>30 THEN SPEED=5
3211 RATE=INT(CAL/SPEED*2)
3215 POSITION 15,2:PRINT #6;".":POSITION 14,2:PRINT #6;SPEED:FOR I=0 TO 30:NEXT
I:SOUND 0,0,0,0:RETURN
3220 Z=0:SOUND 0,30,10,5:POSITION 17,2:PRINT #6;" ":FOR I=0 TO 30:NEXT I:SOUND 0
,0,0,0
3225 POSITION 17,3:PRINT #6;"<"
3230 IF PEEK(53279)=5 THEN DELAY=DELAY+0.1:SOUND 0,30,10,5:GOSUB 3234
3232 IF PEEK(53279)=6 THEN Z=Z+1:IF Z>10 THEN SOUND 0,30,10,5:GOTO 3240
3233 GOTO 3230
3234 IF DELAY>4 THEN DELAY=0
3235 POSITION 16,3:PRINT #6;"0":POSITION 14,3:PRINT #6;DELAY:FOR I=0 TO 30:NEXT
I:SOUND 0,0,0,0:RETURN
3240 Z=0:POSITION 17,3:PRINT #6;" ":POSITION 17,4:PRINT #6;"<":FOR I=0 TO 30:NEX
T I:SOUND 0,0,0,0
3245 IF PEEK(53279)=5 THEN TONE=TONE+1:GOSUB 3260
3250 IF PEEK(53279)=6 THEN Z=Z+1:IF Z>10 THEN SOUND 0,30,10,5:GOTO 3270
3255 GOTO 3245
3260 IF TONE>99 THEN TONE=10
3265 POSITION 14,4:PRINT #6;TONE:SOUND 0,TONE,10,10:FOR I=0 TO 10:NEXT I:SOUND 0
,0,0,0:RETURN
3270 Z=0:POSITION 17,4:PRINT #6;" ":POSITION 17,5:PRINT #6;"<":FOR I=0 TO 30:NEX
T I:SOUND 0,0,0,0
3275 IF PEEK(53279)=5 THEN RX=RX-1:GOSUB 3285
3280 IF PEEK(53279)=6 THEN Z=Z+1:IF Z>10 THEN SOUND 0,30,10,5:GOTO 3350
3284 GOTO 3275
3285 IF RX<1 THEN RX=9
3290 POSITION 16,5:PRINT #6;RX:SOUND 0,30,10,5:FOR I=0 TO 30:NEXT I:SOUND 0,0,0,
0
3295 IF RX=9 THEN SIGNAL=10:QRM=0
3300 IF RX=8 THEN SIGNAL=10:QRM=1
3305 IF RX=7 THEN SIGNAL=9:QRM=2
3310 IF RX=6 THEN SIGNAL=9:QRM=3
3315 IF RX=5 THEN SIGNAL=8:QRM=4
3320 IF RX=4 THEN SIGNAL=7:QRM=5
3325 IF RX=3 THEN SIGNAL=5:QRM=6
3330 IF RX=2 THEN SIGNAL=4:QRM=7
3340 IF RX=1 THEN SIGNAL=3:QRM=7
3345 RETURN
3350 Z=0:POSITION 17,5:PRINT #6;" ":POSITION 17,6:PRINT #6;"<":FOR I=0 TO 30:NEX
T I:SOUND 0,0,0,0
3355 IF PEEK(53279)=5 AND CWL=1 THEN SOUND 0,150,10,5:GOSUB 3380
3360 IF PEEK(53279)=5 AND CWL=0 THEN SOUND 0,30,10,5:GOSUB 3390
3365 IF PEEK(53279)=6 THEN Z=Z+1:IF Z>10 THEN SOUND 0,30,10,5:GOTO 3400
3370 GOTO 3355
3380 POSITION 14,6:PRINT #6;"NO.":CWL=0:TYPE=10:FOR I=0 TO 30:NEXT I:SOUND 0,0,0
,0:RETURN
3390 POSITION 14,6:PRINT #6;"YES":CWL=1:TYPE=36:FOR I=0 TO 30:NEXT I:SOUND 0,0,0
,0:RETURN
3400 Z=0:POSITION 17,6:PRINT #6;" ":POSITION 17,7:PRINT #6;"<":FOR I=0 TO 30:NEX
T I:SOUND 0,0,0,0
3405 IF PEEK(53279)=5 AND CWN=1 THEN SOUND 0,150,10,5:GOSUB 3430
3410 IF PEEK(53279)=5 AND CWN=0 THEN SOUND 0,30,10,5:GOSUB 3440
3415 IF PEEK(53279)=6 THEN Z=Z+1:IF Z>10 THEN SOUND 0,30,10,5:GOTO 3450
3420 GOTO 3405
3430 POSITION 14,7:PRINT #6;"NO.":CWN=0:FOR I=0 TO 30:NEXT I:SOUND 0,0,0,0:RETUR
N
3440 POSITION 14,7:PRINT #6;"YES":CWN=1:FOR I=0 TO 30:NEXT I:SOUND 0,0,0,0:RETUR
N
3450 IF CWL=0 AND CWN=0 THEN SOUND 0,70,10,5:FOR I=0 TO 40:NEXT I:SOUND 0,0,0,0:
GOTO 3470
3455 IF CWL=1 AND CWN=1 THEN MIXED=1
3456 IF CWL<CWN OR CWL>CWN THEN MIXED=0
3460 GOTO 3480
3470 POSITION 17,7:PRINT #6;" ":GOTO 3350
3480 Z=0:POSITION 17,7:PRINT #6;" ":POSITION 17,8:PRINT #6;"<":FOR I=0 TO 30:NEX
T I:SOUND 0,0,0,0
3485 IF PEEK(53279)=5 THEN TIME=TIME+10:SOUND 0,30,10,5:GOSUB 3500
3490 IF PEEK(53279)=6 THEN Z=Z+1:IF Z>10 THEN SOUND 0,30,10,5:GOTO 3510
3495 GOTO 3485
3500 IF TIME>430 THEN TIME=10:POSITION 16,8:PRINT #6;"."
3505 POSITION 14,8:PRINT #6;TIME:FOR I=0 TO 15:NEXT I:SOUND 0,0,0,0:RETURN
3510 Z=0:POSITION 17,8:PRINT #6;" ":POSITION 17,9:PRINT #6;"<":FOR I=0 TO 30:NEX
T I:SOUND 0,0,0,0
3515 IF PEEK(53279)=5 THEN SOUND 0,70,10,5:FOR I=0 TO 30:NEXT I:GOTO 3000
3520 IF PEEK(53279)=6 THEN SOUND 0,30,10,5:FOR I=0 TO 30:NEXT I:SOUND 0,0,0,0:GO
TO 5000
3525 GOTO 3515
4000 REM xxxxTHE MORSE CODExxxxxxxxxxx
4005 GRAPHICS 1+16:SETCOLOR 4,4,1:SETCOLOR 0,13,10
4010 FOR D=0 TO 19:POSITION D,0:PRINT #6;"x":NEXT D
4015 FOR D=0 TO 19:POSITION D,22:PRINT #6;"x":NEXT D
4020 FOR D=0 TO 22:POSITION 0,D:PRINT #6;"x":NEXT D
4025 FOR D=0 TO 22:POSITION 19,D:PRINT #6;"x":NEXT D
4030 POSITION 1,1:PRINT #6;" A x-     V xxx-"
4035 POSITION 1,2:PRINT #6;" B -xxx   W x--"
4040 POSITION 1,3:PRINT #6;" C -x-x   X -xx-"
4045 POSITION 1,4:PRINT #6;" D -xx    Y -x--"
4050 POSITION 1,5:PRINT #6;" E x      Z --xx"
4055 POSITION 1,6:PRINT #6;" F xx-x"
4060 POSITION 1,7:PRINT #6;" G --x    1 x----"
4065 POSITION 1,8:PRINT #6;" H xxxx   2 xx---"
4070 POSITION 1,9:PRINT #6;" I xx     3 xxx--"
4075 POSITION 1,10:PRINT #6;" J x---   4 xxxx-"
4080 POSITION 1,11:PRINT #6;" K -x-    5 xxxxx"
4085 POSITION 1,12:PRINT #6;" L x-xx   6 -xxxx"
4090 POSITION 1,13:PRINT #6;" M --     7 --xxx"
4095 POSITION 1,14:PRINT #6;" N -x     8 ---xx"
4100 POSITION 1,15:PRINT #6;" O ---    9 ----x"
4105 POSITION 1,16:PRINT #6;" P x--x   0 -----"
4110 POSITION 1,17:PRINT #6;" Q --x-"
4115 POSITION 1,18:PRINT #6;" R x-x"
4120 POSITION 1,19:PRINT #6;" S xxx     x = DIT"
4125 POSITION 1,20:PRINT #6;" T -       - = DAH"
4130 POSITION 1,21:PRINT #6;" U xx-"
4150 IF PEEK(53279)<>7 THEN 4200
4160 GOTO 4150
4200 FOR T=0 TO 5
4210 FOR V=200 TO 10 STEP -20
4220 SOUND 0,V,10,5:SOUND 1,V+1,10,5:SOUND 2,V+2,10,5:SOUND 3,V+3,10,5:NEXT V:NE
XT T
4230 SOUND 0,0,0,0:SOUND 1,0,0,0:SOUND 2,0,0,0:SOUND 3,0,0,0:CODE=0:GOTO 3000
5000 LENGTH=0:GRAPHICS 0:SETCOLOR 4,12,7:SETCOLOR 2,0,0:SETCOLOR 1,0,0:POKE 752,
1:RETURN
5010 REM xxxxxxxxxx C.S.BARLOW xxxxxxx
5020 REM xxxxxxxxxx C.S.BARLOW xxxxxxx
5030 REM xxxxxxxxxx C.S.BARLOW xxxxxxx
5040 REM xxxxxxxxxx C.S.BARLOW xxxxxxx
5050 REM xxxxxxxxxx C.S.BARLOW xxxxxxx
5060 REM xxxxxxxxxx C.S.BARLOW xxxxxxx
```

JAWBREAKER

Jawbreaker is a fascinating new disk based game for the ATARI personal computer.
It will run on an 800 machine with an 810 disk drive and a joystick.
The object of the game is to move your player through a maze whilst 'eating' sweets in the process. Quite a simple game it may appear at first sight, however things are made more difficult by the fact that you are being chased by a number of unfriendly faces, who if successful in catching you, promptly remove all your teeth, without which you cannot continue to 'eat' sweets.
You have only three sets of teeth before the game ends. If you manage to eat all the sweets on the screen your teeth are given a quick brush (guaranteed to bring a smile to your face).
Each screen full of sweets gets progressively more difficult to eat as the chasing faces get faster and faster. Some help is given to you in the form of a spare set of teeth if you survive the third round.
A combination of speed, colour and some highly amusing graphics characters results in a totally rivetting game.
Character movement through the maze is achieved by using player missile graphics so that movement is both continuous and very smooth.
Order As BQ26D (Jawbreaker) Price £22.95.



THE U.K. ATARI COMPUTER OWNER'S CLUB

(An independent user's group)

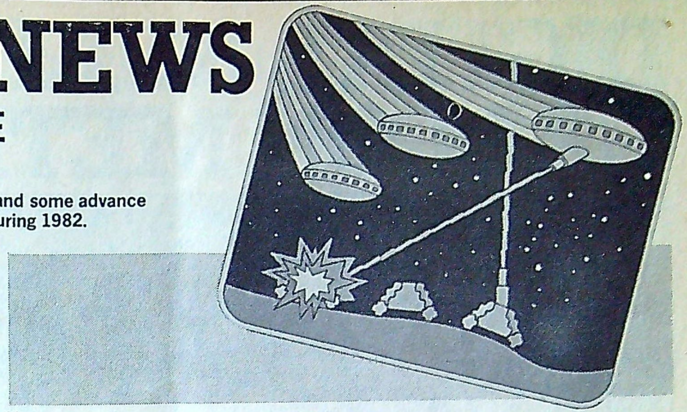
Now you can join the U.K. Atari Computer Owner's Club for just £1.60 a year. Every three months you'll receive a copy of the club's own magazine packed with information about your Atari. If you own an Atari, join the club now! Please send your subscription to: Graham, Maplin Electronic Supplies Ltd, P.O. Box 3, Rayleigh, Essex SS6 8LR. (If paying with an order, use the order code GG25C.)

ATARI NEWS

ATARI VIDEO GAME

Latest Cartridge Details

This month, details of five new cartridges and some advance information on cartridges to be released during 1982.



Super Breakout

For one or two players using paddles, this game cartridge contains nine different games. Games 1, 3, 5, 7 and 8 are for one player whilst games 2, 4, 6 and 9 are for 2 players. Games 1 and 2 are standard Breakout. In games 3 and 4 you have two paddles and two balls are served: this is Double Breakout. Games 5 and 6 are Cavity Breakout. You have two paddles, but only one ball is served. However, two other balls are trapped in the wall. You must knock the bricks out to release the balls, then use those balls as well.

Game 7 is Progressive Breakout. When this game begins the playfield contains four rows of bricks at the top of the screen, followed by four blank rows, then four more rows of bricks. As the game progresses the walls move towards the bottom of the screen and new bricks enter the top of the playfield. Games 8 and 9 are especially easy versions of standard Breakout for young children.

Order As AC48C (Super Breakout) Price £29.95

Freeway

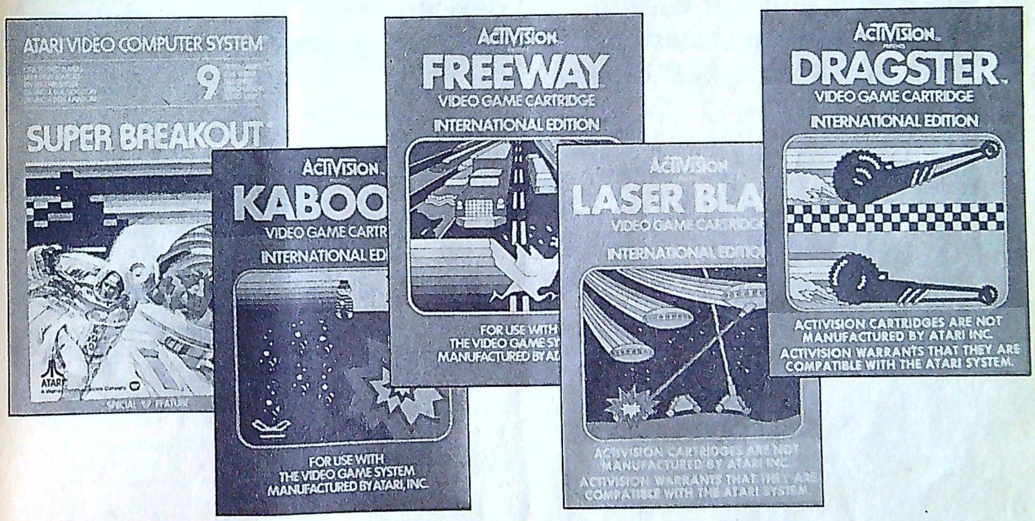
For one or two players using joysticks, this game cartridge contains eight games. In each game there are ten lanes of traffic, five in each direction. Your task is to get your chicken across the road in the shortest possible time. In games 1 to 4 the amount of traffic on the road and the speed at which they move gets higher as the game number gets higher. Games 5 to 8 are similar, but the speed of the traffic in each lane changes at random. Each game is accompanied by the sounds of a freeway: the drone of car and lorry engines and the toots from the horns of the vehicles. All games are for 1 or 2 players.

Order As AC51F (Freeway) Price £19.95

Dragster

For one or two players using joysticks, this game cartridge contains 2 games. In game 1 the dragster steers straight ahead, but in game 2 it is steerable. Both games are for one or two players. You're on the starting line and the clock is counting down to zero. You must get to the finish line in the shortest possible time. To do this you must clutch and shift through four gears always keeping your revs as high as possible. But watch your tachometer. If the revs stay too high for too long, you'll blow up.

Order As AC52G (Dragster) Price £19.95


ATARI VIDEO COMPUTER SYSTEM
9
SUPER BREAKOUT
ATARI
SPECIAL FEATURE
ACTIVISION
KABOO
VIDEO GAME CARTR
INTERNATIONAL ED
FOR USE WITH THE VIDEO GAME SYSTEM MANUFACTURED BY ATARI, INC.
ACTIVISION
FREEWAY
VIDEO GAME CARTRIDGE
INTERNATIONAL EDITION
FOR USE WITH THE VIDEO GAME SY MANUFACTURED BY AT
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INTERNATIONAL EDITIO
ACTIVISION CARTRIDGES ARE NOT MANUFACTURED BY ATARI INC.
ACTIVISION WARRANTS THAT THEY ARE COMPATIBLE WITH THE ATARI SYSTEM.
ACTIVISION
DRAGSTER
VIDEO GAME CARTRIDGE
INTERNATIONAL EDITION
ACTIVISION CARTRIDGES ARE NOT MANUFACTURED BY ATARI INC.
ACTIVISION WARRANTS THAT THEY ARE COMPATIBLE WITH THE ATARI SYSTEM.

Kaboom!

For one or two players using paddles, this game cartridge contains two games. Game 1 is you versus the "Mad Bomber" and game 2 is you and a friend taking turns against the Mad Bomber. The bombs are falling all around you and you must catch them in one of your three buckets of water. Each group of bombs dropped is more difficult to catch than the group before, but it scores more points. If you drop a bomb, all the bombs explode and you lose one of your buckets. Score over 3,000 points and you can join the Activision "Bucket Brigade", but to reach maximum points may be more difficult as the game scores up to 999,999!

Order As AC49D (Kaboom!) Price £19.95

Laser Blast

For one player using a joystick controller, this game cartridge contains one game with four levels of play. The difference between games is how rapidly the speed and firing rate of the enemy ground attackers improves as the game progresses. You control a spacecraft, firing your laser blaster at the enemy forces on the ground. Flying low to the ground will help you keep under the enemy's radar and undetected. However, each new wave of enemy attackers has a stronger force field which gradually pushes you away from the ground making you an easier and easier target. Now you must be very quick to avoid the enemy fire.

Order As AC50E (Laser Blast) Price £19.95

Coming Soon

War Lords

Now planned for release in early February this cartridge has 28 games and uses paddle controllers.

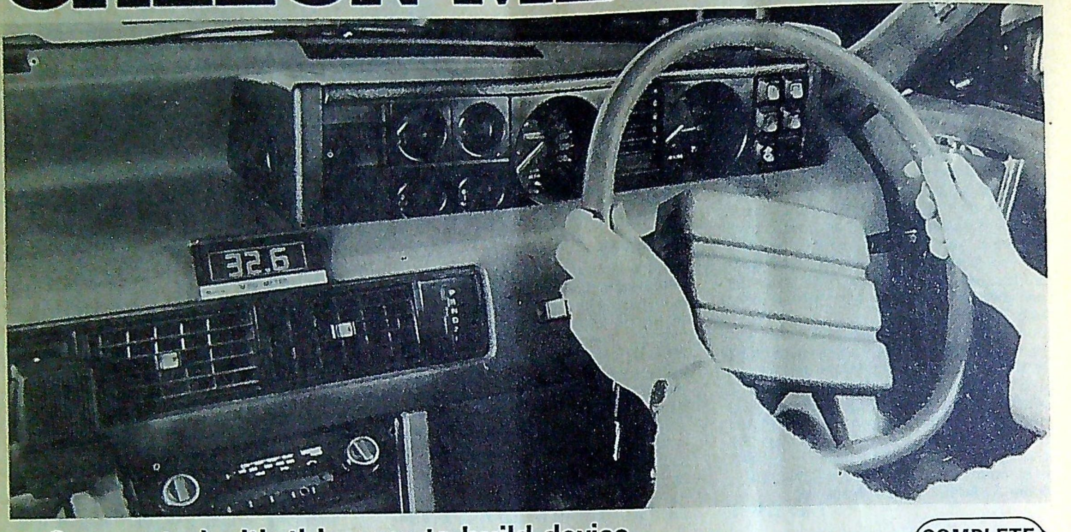
Order As AC44X (War Lords) Price £29.95

Lots More Titles

There are lots more exciting new titles planned for release this year including Hot Rox, Berserk, Yar's Revenge, Pacman, Defender, Foxbat, Adventure I, Adventure II and Bridge. Full details in the next Maplin Magazine.

DIGITAL MILES~PER~ GALLON METER

by M. Wharton



- ★ Save petrol with this easy to build device.
- ★ Discover your car's most economical cruising speed.
- ★ Large easy to read LED display.

COMPLETE KIT £44.95

With the price of petrol continuing on its upward spiral, any device which can offer some means of economising on fuel consumption must be a winner! This mph meter uses readily available transducers and produces a continuous display of fuel consumption under all driving conditions. Using the meter, it is thus possible to compare the petrol used when accelerating and cruising at speed; it is also possible to find the driving conditions which yield the optimum fuel consumption.

The basis of the design is two transducers; one transducer produces a signal in response to the flow of fuel, whilst the other is connected into the speedometer drive cable and gives an output which corresponds to road speed. The meter takes these two signals and produces a continuous digital display of miles per gallon of fuel.

Circuit

The signal from the speed transducer is first "cleaned up" and then used to trigger a monostable, formed by IC1c and 1d, which has a very short time constant. At the same time, the signal from the fuel transducer is used to clock the divider, IC6. The chosen output from the divider is then used to trigger the dual monostable, IC5, in the following manner; a positive going edge on pin 4 produces an output positive pulse of about 1ms duration on pin 6; this is connected both to pin 11 of IC5 and pin 2 of IC6, triggering the second monostable on the falling edge and also resetting the divider. The same output is used as the latch signal for the display counter/driver. The two outputs, Q_2 and $\bar{Q}_2$, from the second monostable are used to reset the display counter/driver and inhibit the scaling oscillator circuit via IC2c and IC2d.

The purpose of the oscillator formed by IC1a, 1b and 2c and the gated flip-flop formed by IC2a, 2b and 2d is to enable the display to be calibrated to give a true reading and provides a means of taking into account the variety of different gearing ratios between engine and road wheels and the speedo drive cable.

During the counting period, set according to the position of link 'A', this oscillator, in combination with IC3 and IC4, produces a series of pulses which are counted by IC7. By selecting a suitable link 'B', a wide variety of gear ratios may be accommodated and the unit calibrated accordingly to give an accurate reading of miles per gallon. The series of pulses counted by IC7 are then displayed at the end of the counting period by applying the latch signal. When IC6 is reset and the whole process commences again. IC7 and the associated transistors TR2, 3 and 4 provides all the necessary signals to drive an LED display.

Construction

Fuel Flow Transducer

This has to be fitted into the fuel line between the pump and the carburettor; it is not sensitive to the direction of fuel flow but it is recommended that it be positioned with the flow axis vertical to allow air bubbles to escape. It should not be mounted where it will be subjected to excessive heat (obviously!) or where ingress of water could be a problem. The connecting cable is colour coded:

Red: to +5V, through a current limiting

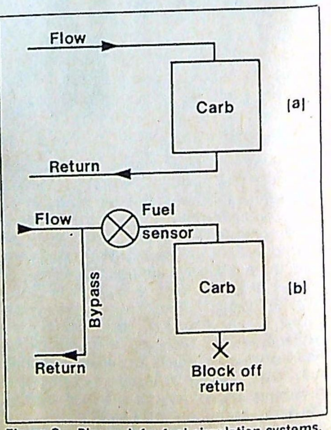


Figure 2. Pipework for fuel circulation systems.

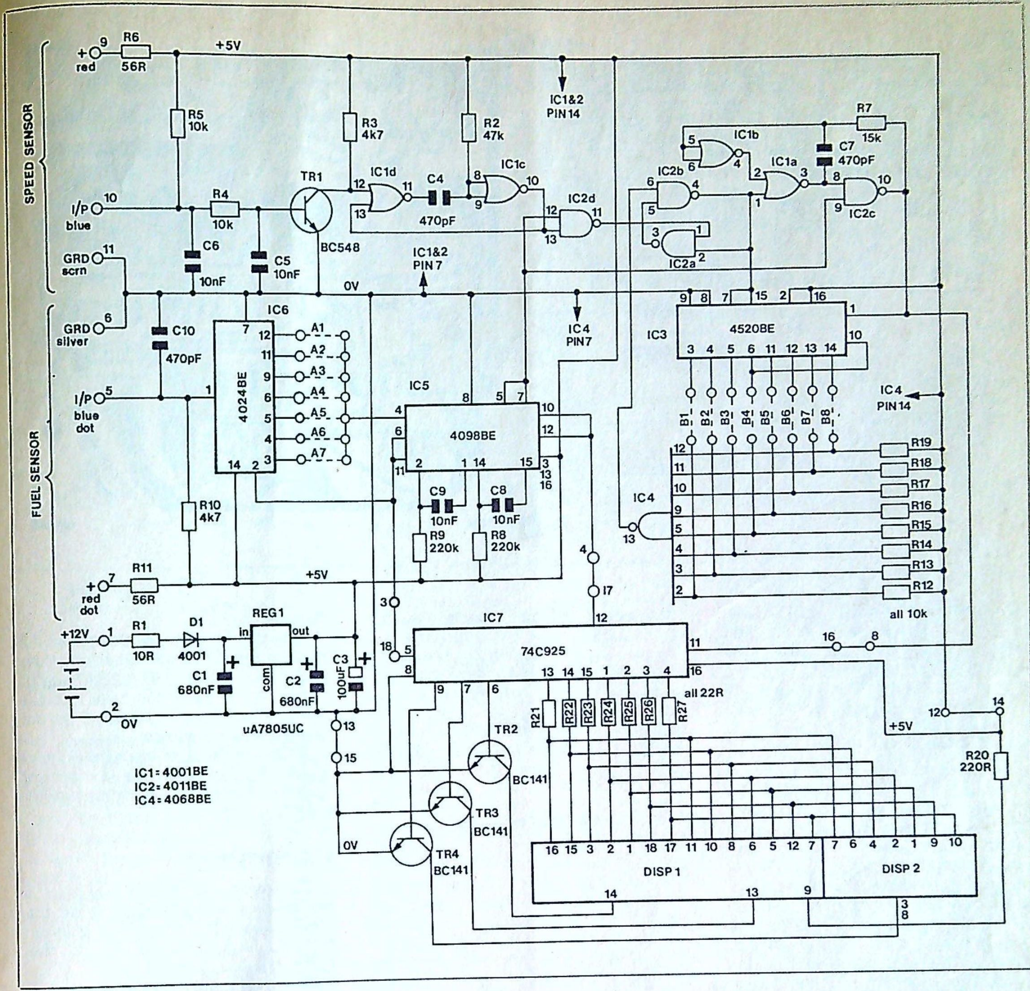
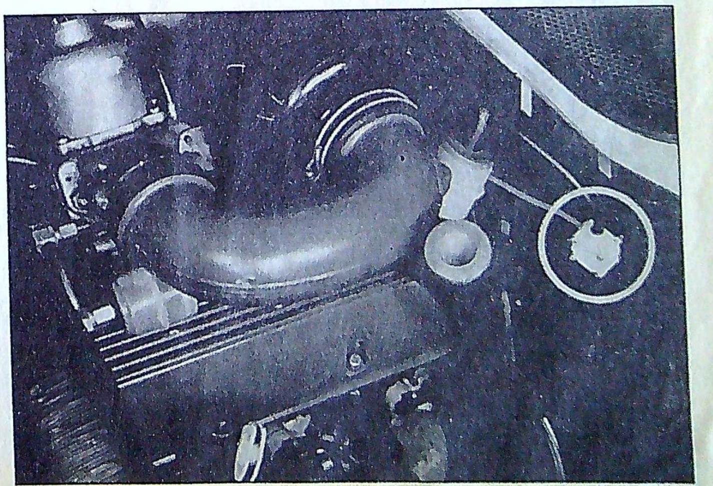


Figure 1. Circuit diagram of mpg meter.

resistor (included in the main circuit).
Blue: signal output.
Screening: connected to ground (0V).

Many modern cars have fitted some form of continuous fuel circulation between the tank and carburettor. This is to prevent evaporation of fuel and comply with various Federal and European regulations on emission control. In order to give a sensible reading, the fuel flow transducer must only have fuel passing through it which is used by the engine, and not that in continuous circulation. To achieve this it may be necessary to slightly modify the pipework, usually by fitting some form of bypass between "flow" and "return" and fitting the transducer in the arm taken from the "flow" side, as in Figure 2.

This method may also be used on cars fitted with fuel injection, by placing the transducer in same position relative to the metering pump, i.e. in the low pressure feed line. **(CAUTION: Under no circumstances attempt to fit it in the**



Flow transducer fitted in fuel line.

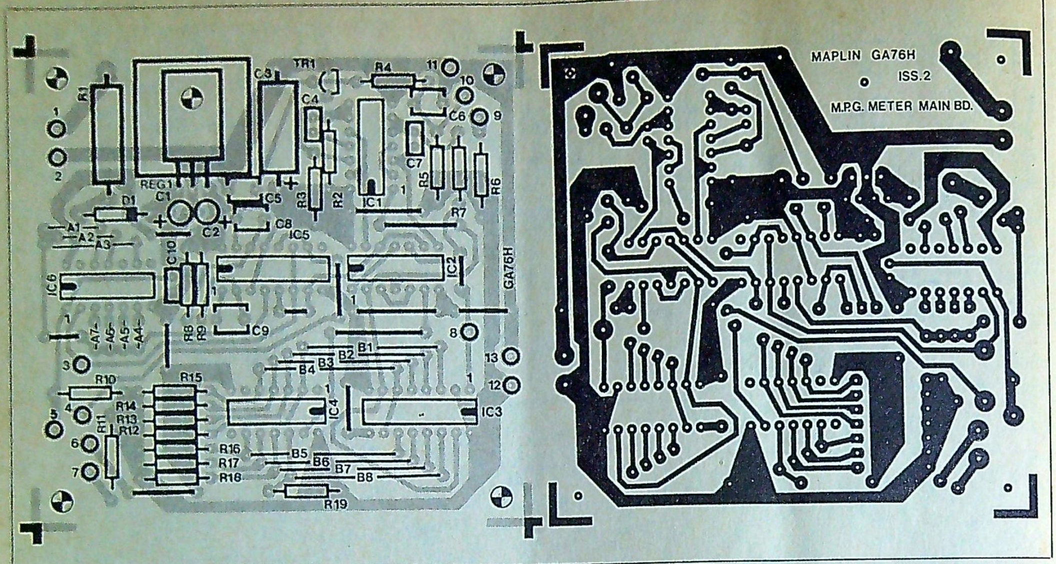


Figure 3. Main PCB track layout and component overlay.

high pressure injector lines!) Care needs be exercised here as the feed pressure is important to ensure correct filling of the metering pump and without a constant flow through the pump, trapped air or vapour bubbles can present a problem.

Speed Transducer

To fit this, remove the speedo cable and cut the outer sheath at the point where it is intended to fit the transducer; again, keep it away from heat and/or water. Make a second cut, removing ½" of the sheath from one of the cut ends and discard. Remove any burrs from the sheath ends. Remove any oil or grease from the inner core and replace it into the short sheath section. Place the transducer cable clamps (not included in the parts list, but use small jubilee clips or similar) on both ends of the transducer. Insert the loose end of the cable core into the single terminal end of the transducer and push through the internal friction bushing. This can be a tight fit, so take care not to kink or distort the inner cable. Tighten the clamp, but make sure the core is still free to rotate; some sheaths will require insulating tape wrapped over the end to make up the diameter to obtain a firm grip. Feed the loose cable core into the long sheath section until it also seats into the transducer and tighten the clamp carefully. Before refitting the speedo cable to the vehicle make sure the inner core does not bind in any way — there should be about 1mm of free movement along the axis of the transducer. Any tightness or binding will cause excessive cable wear or oscillation of the speedo indicator needle. This is an operation which needs to be performed with care, making sure, for example, that there will be enough room for the transducer in the position it is intended to fit before cutting the outer sheath.

Two PCBs are required. One is a display board and ideally should be fitted into the car dashboard, the other is the main logic board which holds all the major components and may be mounted in any convenient place out of sight. It is connected to the display board by only 5 wires. Note that one of the corner fixing holes in the main board is in the PCB 0V line, so that if the PCB is fixed to the car chassis the 0V line will be grounded.

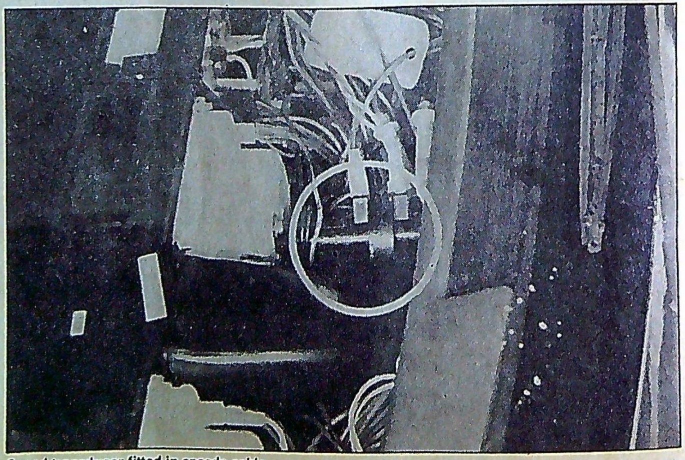
Construct the main PCB. First insert all links (only some of links A1-7 and B1-8 will need to be made). Next fit IC holders, resistors, diode, transistor and capacitors, taking note of polarisation. Mount REG.1 onto the PCB. Smear the mica washer both sides with Thermpath and position onto the vaned heatsink. Bend REG.1 over onto heatsink and bolt through the PCB. Finally, fit Veropins and ICs.

Now construct the display board. Fit all links, resistors and transistors, then fit displays noting that on the side of display 1, the 'M' in the code number relates to pin 1 and for display 2 the dot on the display is next to pin 4.

Finally fit the IC holder and IC7 and insert Veropins from the component side so they protrude from the rear for ease of wiring.

Calibration

To ensure that the display gives a true reading, it is necessary to set the links between IC3 and IC4 to give the required scaling factor. To do this accurately the speed of rotation of the speedo cable needs to be known at, say, 30 mph. Sometimes it is possible to obtain such information from the manufacturers, when it is often given as



Speed transducer fitted in speedo cable.

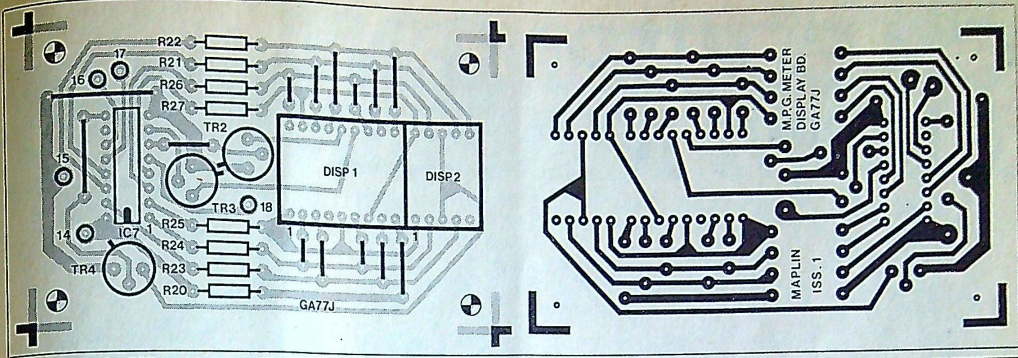


Figure 4. Display PCB track layout and component overlay.

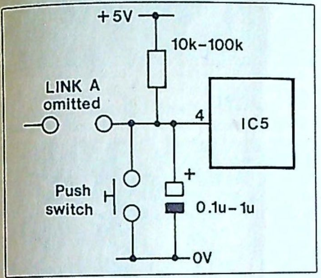


Figure 5. Calibration circuit.

the number of turns per mile travelled. If this is not known, then the meter itself may be used to measure the required output frequency from the speed transducer. To do this, omit IC6 and set link 'B' temporarily to position '1'. The circuit shown in Figure 5 can then be used to provide pulses for IC5.

Measurement of the output frequency is obtained by first driving the car at a constant speed of 30 mph, indicated by the speedo; the push switch is closed and then opened at the start of a timed interval of 10 seconds. At the end of this time the switch is closed and allowed to open on the ten second mark. The display should then show the required frequency (ignoring the decimal point on the display). The value should be expected to be in the range 100 to 200Hz and it would be a good idea to take an average of several such readings.

The scaling factor for the counter circuit can then be found from the following equation using the appropriate values:

$$\frac{8.5 \times 3000}{X \times Y} = n$$

where X is the division ratio of the 4024 divider selected, Y is the frequency obtained above and n is the scaling factor. For example, if the divider is set on '8' and the frequency at 30 mph is 140Hz, then

$$\frac{8.5 \times 3000}{8 \times 140} = 22.76$$

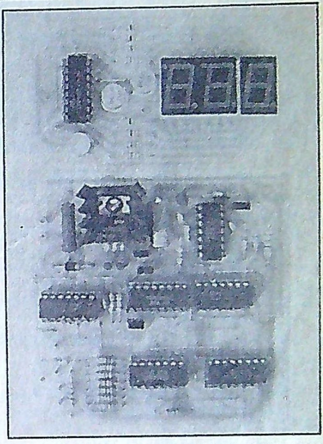
This must be rounded to the nearest whole number, in this case 23.

The factor is set by connecting the appropriate links between IC3 and IC4, each link having the following "value":

LINK B	1	2	3	4	5	6	7	8
VALUE	1	2	4	8	16	32	64	128

So to set a scaling value of 23, the links number 1, 2, 3 and 5 would be made; i.e. value = 1+2+4+16 = 23.

If it is chosen to set the 4024 divider to some ratio other than 8, then the scaling factor would need to be altered accordingly. The choice is not critical, but it should be remembered that whilst low division ratios will give a more instantaneous reading of mpg, such variations as fuel pump surges will give a fluctuating display; higher division ratios will allow more time for these variations to be averaged out, and a ratio of 8 is suggested as a starting point. ■



MPG METER PARTS LIST

Resistors — all ⅓W 5% carbon unless specified			
R1	10R 3W wirewound		(W10R)
R2	47k		(M47K)
R3,10	4k7	2 off	(M4K7)
R4,5,12-19	10k	10 off	(M10K)
R6,11	56R ½W	2 off	(S56R)
R7	15k		(M15K)
R8,9	220k	2 off	(M220K)
R20	220R		(M220R)
R21-27	22R	7 off	(M22R)
Capacitors			
C1,2	680nF 35V tantalum	2 off	(WW59P)
C3	100uF 10V axial electrolytic		(FB48C)
C4,7,10	470pF ceramic	3 off	(WX64U)
C5,6,8,9	10nF monocap	4 off	(YY08J)
Semiconductors			
IC1	4001BE		(QX01B)
IC2	4011BE		(QX05F)
IC3	4520BE		(QX33L)
IC4	4068BE		(QX24B)
IC5	4098BE		(QX29G)
IC6	4024BE		(QX13P)
IC7	74C925		(QY08J)
REG 1	uA7805UC		(QL31J)
D1	1N4001		(QL73Q)
TR1	BC548		(QB73Q)
TR2,3,4	BC141	3 off	(QB38R)
Miscellaneous			
DISP 1	DD display type C		(BY68Y)
DISP 2	½" display type 4		(FR41U)
	Vaned heatsink		(FL58N)
	Kit 'P' plas		(WR23A)
	Small thermpath		(HQ00A)
	DIL skt 14-pin	4 off	(BL18U)
	DIL skt 16-pin	3 off	(BL19V)
	Veropin 2141	18 off	(FL21X)
	Flow sensor		(YX86T)
	Speed sensor		(YX85G)

A complete kit of parts is available. **Order As LW67X (MPG Meter Kit) Price £44.95**

CB EQUIPMENT FROM MAPLIN

40-Channel FM Transceiver

A good quality CB transceiver to the U.K. specification (CB27/81). Similar to sets selling at £79.95 we have cut out the importers and wholesalers margins by importing direct, to save you up to £30. All units are tested in our laboratory before despatch. Here's a run-down on the facilities offered.

- * 40-channel 27MHz FM
- * Transmit power/received signal strength meter
- * Public address/CB switch
- * LED channel indicator with dim control
- * Receive volume control
- * 4W output
- * RF gain control
- * Squelch control
- * Microphone with curly lead and locking connector
- * Extension speaker socket (3.5mm jack required)
- * PA speaker socket (3.5mm jack required)
- * Supplied complete with microphone, fixing brackets for unit and mic, connecting leads with fuse and instruction leaflet with 10-code etc.

This excellent unit will be available from mid-March at this amazing price inclusive of VAT and P&P.

Order As AF46A (CB Model GT-868)
Price £49.95

CB Power Supply

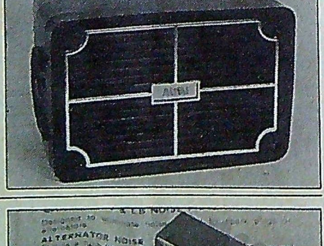
Many of the lower priced power units offered for sale are very dangerous, but this unit meets the British safety standards. The unit will easily drive any CB set and all accessories. The power unit will deliver a regulated 13.8V at any current up to 3A continuous, 5A surge. It is short-circuit protected and is fitted with a fuse. There is an on/off switch and power on indicator and approx. 2m of 3-core flex for connection to 240V mains. Overall size 155 x 115 x 60mm.

Order As XG10L (12V 3A Power Unit)
Price £16.95

CB Extension Speaker

A deluxe CB extension speaker in a black plastic cabinet with silver trim. Fitted with a 5x3in. speaker rated at 8W, 8Ω. Supplied complete with adjustable mounting bracket and approx. 2.5m lead terminated in a 3.5mm plug. Overall size 147 x 104 x 100mm.

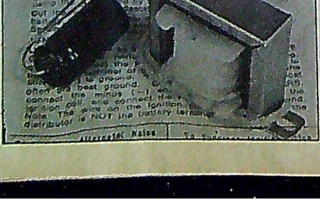
Order As YK29G (Ext CB Speaker)
Price £7.45

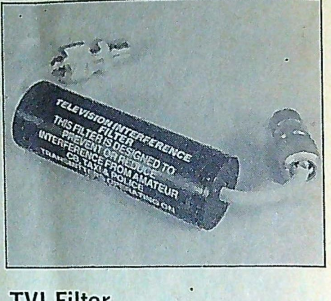


Car Stereo and CB Noise Filter

A high inductance choke designed to be connected in series with the 12V power supply line of a car stereo or CB set. A capacitor is also included which between them reduce alternator and ignition noise. Supplied with instructions.

Order As YL42V (Filter Choke) Price £1.99

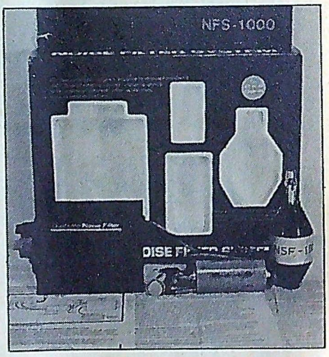



TELEVISION INTERFERENCE FILTER
THIS FILTER IS DESIGNED TO PREVENT OR REDUCE INTERFERENCE FROM AMATEUR

TVI Filter

A high quality filter designed to be inserted in the aerial leads of TV sets suffering from interference from CB transmissions. The filter is peaked to reject signals from transmitters operating on 27 to 28MHz while giving a very low insertion loss to UHV TV signals. The unit plugs directly onto the end of the existing TV aerial lead.

Order As YL43W (TVI Filter) Price £5.25



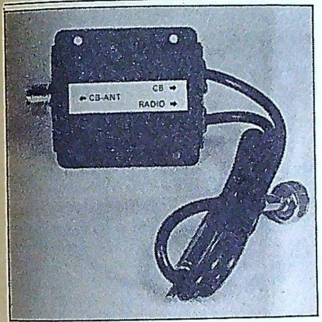
Noise Filter System

A unique combination of filters designed to eliminate interfering noises from various sources in the car. The ignition noise suppressor plugs directly into the distributor cap and is inductive rather than the usual resistive type thus keeping the DC spark voltage high, but offering very high reistance to hf signals. The normal type of resistive suppressor does reduce the efficiency of the engine and makes the car harder to start in cold weather. A large filter is included for connection in the live and return paths of the power supply to the CB set giving a very high immunity to noise entering the set by this route. An alternator noise filter and generator noise filter are also included. The one not required by your car can be used to suppress for example the turn indicators, or windscreen wiper motor etc. The units are attractively packaged and supplied with detailed instructions.

Order As YK30H (Noise Filter System)
Price £10.95

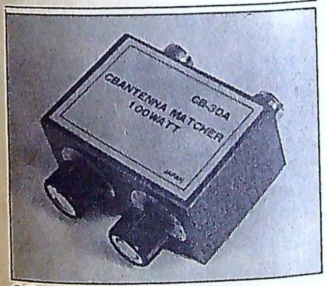
CB Antenna Converter

Now you can use your existing car aerial to receive and transmit from your CB set. Simply unplug aerial from radio and connect the three leads supplied with the converter as shown in the instructions. The leads are ready terminated with correct plugs and sockets for direct connection. A mounting kit is also supplied. The front panel of the converter has a switch for CB or radio, an SWR adjustment control and an indicator lamp that should light when transmitting. Overall dimensions 85 x 60 x 50mm.
Order As YL44X (CB Aerial Converter)
Price £7.25



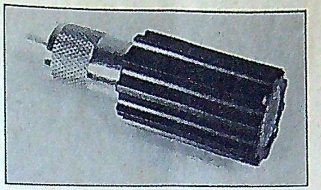
CB/Car Radio Aerial Coupler

This unit enables the CB and radio set to share the one CB aerial. The existing CB aerial connects directly to the socket on the coupler whilst two leads are provided, one terminated in a standard plug for direct connection to the CB set and one terminated in a car aerial plug for direct connection the radio set. Trimmers for the CB and the radio can be adjusted through holes in the front of the coupler. Overall size 67 x 46 x 30mm.
Order As YQ73Q (CB/Radio Aerial Coupler)
Price £5.49



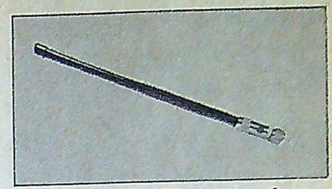
CB Aerial Matcher

A very useful accessory for all CB sets as careful adjustment can greatly improve matching of rig to aerial. Fitted with two SO239 sockets, the unit is rated at 100W. Overall size 78 x 55 x 40mm.
Order As YQ74R (CB Aerial Matcher)
Price £5.25



Dummy Load

A dummy load rated at 30W for testing and setting-up CB and amateur radio transceivers. The dummy load has a nominal 50 Ω impedance and is terminated in a PL259 plug.
Order As HL94C (30W Dummy Load)
Price £6.75



SWR Meters, Mount and Rubber Duck

Check out our large range of excellent SWR meters and testers shown on pages 294 and 295 of our catalogue, our magnetic base on catalogue page 20 and our 27MHz rubber duck that was described in a recent newsletter. The price of the rubber duck is shown under 'Aerials' in our new item price list on page 37 of this magazine.

More UHF Plugs and Sockets

In addition to our existing range of UHF-type plugs and sockets shown on page 77 of our current catalogue, we are introducing five new types.

Right-Angle Plug (PL259)
A standard PL259 plug with a right angle cable input and reducer for connection to RG58/UR76-type cable.
Order As HL95D (RA PL259 Plug)
Price 85p

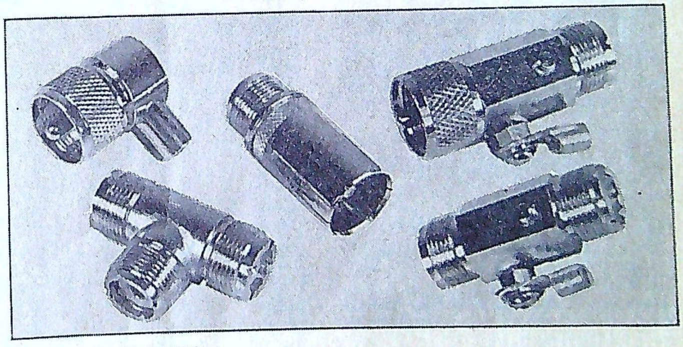
Quick-Connect Plug (PL259)
This adaptor has a SO239 socket into which a standard PL259 plug connects. The other end of the adaptor is a PL259 plug without the usual screw fixing. Instead there is a sprung surround so that the plug may be push fixed onto the socket for quick connection and disconnection.
Order As HL96E (Quick-Connect PL259)
Price 99p

Female T-Adaptor
Adaptor to couple three PL259 plugs together.
Order As RK00A (UHF Female T Adaptor)
Price £1.75

Lightning Arresters Adaptors
On both these adaptors a terminal is attached for connection to earth. In the event of a lightning strike, the current is diverted to earth thus protecting the equipment. Two types are available.

Female/Female
A straight through adaptor for connecting two PL259 plugs together with provision for connecting an earth wire.
Order As RK01B (UHF Adaptor FFLA)
Price £1.65

Male/Female
A straight through adaptor for connecting a PL259 plug to an S0239 socket, but with provision for connecting an earth wire.
Order As RK02C (UHF Adaptor FMLA)
Price £1.75



GROUND PLANES

For aerials not mounted on vehicles, a ground plane must be provided which could consist of two or more pieces of 32/.02 wire (or similar) stretched radially away from a metal plate on which the aerial is mounted. The wires should be connected to the plate (which should already be in connection with the outer screen of the feeder cable via the aerial mounting) and each should be at least 2m long. Adjust the lengths and position the wires to obtain the lowest SWR reading. The position of the feeder may also have an effect. It should be easy to obtain readings better than 1.5:1.

Note that large metal objects such as water tanks will affect the performance. It is also important to note that if the SWR reading is worse than 3:1 when you begin, then transmit for as short a time as possible. You will need to have the metal plate supported about 3cm above the ground in order to give clearance for the fixing and connector.

There are two allen screws in our CB aerial which when loosened allow the rod to be extended or shortened slightly. This adjustment may also be used to improve the SWR. It should therefore be possible to reach an SWR of 1:1 on channel 20 by careful adjustment.

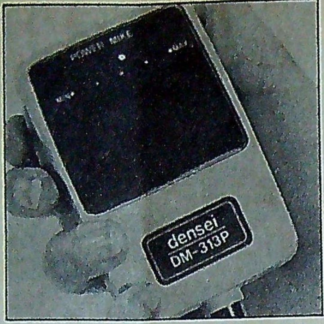
CB EQUIPMENT FROM MAPLIN

CB Microphones

With all these microphones, a plug to suit your CB set is required. See catalogue page 77 (Locking Connectors).

Hand-Held Power Mic With Roger Beep
A hand held microphone with internal pre-amplifier powered by a standard PP3 battery (not supplied). An internal switch is provided that may be changed over if battery is flat or not installed so that microphone may still be used, but unamplified. A slide volume control is fitted and a red LED lights when transmitting (if battery OK).
When the transmit switch is released, a "Roger" beep is transmitted to alert the other party.

Specification:
Type: Dynamic moving-coil omni-directional
Impedance: 10k
Output level: -35dB (with pre-amp)
-78dB (without pre-amp)
Max output: 1.5V
Frequency response:
300Hz to 6kHz (with pre-amp)
300Hz to 8kHz (without pre-amp)
Cable: 1.8m coiled 4-core screened lead
Dimensions: 92 x 60 x 38mm
Weight: 210g
Supplied with connection diagram.
Order As RK03D (Power Mic DM313P)
Price £11.75



Hand-Held Power Mic With Compressor And Roger Beep
A hand-held microphone with internal pre-amplifier and compressor amplifier powered by a standard PP3 battery (not supplied). A slide volume control is fitted and a red LED lights when transmitting (if battery OK). The compressor allows maximum power signals (full deviation) at all times without distortion. When the transmitter switch is released, a "Roger" beep is transmitted to alert the other party.

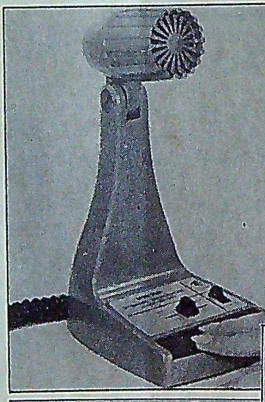
Specification:

Type: Dynamic moving coil omni-directional
Output level: -28dB
Max output: 40mV
Impedance: 3k
Frequency response: 300Hz to 8kHz
Compression level: 40dB
Cable: 1.8m coiled 4-core screened lead
Dimensions: 96 x 60 x 40mm
Weight: 225g
Supplied with connection diagram.
Order As RK04E (Power Mic DM311P)
Price £13.95

Base Station Microphone With Compressor
A base station microphone with built-in pre-amplifier and compressor amplifier powered by a standard PP3 battery (not supplied). A slide volume control is fitted and a red LED lights when transmitting (if battery OK). The compressor allows maximum power signals (full deviation) at all times without distortion. A switch is provided in the base so that the same connections may be utilised whether the transceiver utilises relay or electronic switching. A large transmit plate is provided along with a locking facility. The microphone head is vertically adjustable and the whole unit is built in a bronze-colour diecast metal body.

Specification:

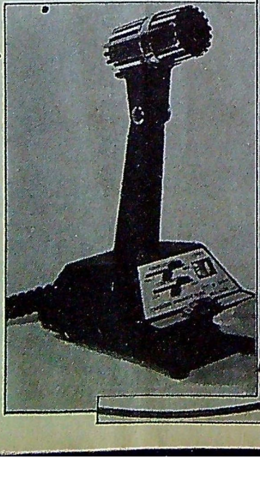
Type: Dynamic moving coil uni-directional
Output level: -25dB
Impedance: 4k
Frequency response: 200Hz to 5kHz
Compression level: 40dB
Cable: 1.8m coiled 4-core screened lead
Height: 235mm
Supplied with connection diagram.
Order As XG11M (Base Station Mic DX357)
Price £33.50



Base Station Microphone With Level Meter
A base-station microphone with built-in pre-amplifier powered by a standard PP3 battery (not supplied). A slide volume control is fitted and a red LED lights when transmitting (if battery OK). A slide tone control is also included and a transmitted signal level meter so that volume can be set accurately. A large transmit plate is provided along with a locking facility. The microphone head is vertically adjustable and the whole unit is built in a black diecast metal body.

Specification:

Type: Dynamic moving coil uni-directional
Output level: -35dB
Max output: 1.5V
Frequency response: 250Hz to 8kHz
Impedance: 1k
Tone control: +10dB at 1kHz
Cable: 1.8m coiled 4-core screened lead
Height: 225mm
Supplied with connection diagram.
Order As XG12N (Base Station Mic BSA610A)
Price £33.50



Other CB Microphones and Holders

A range of other microphones designed for use with CB transceivers including some holders for hand-held microphones are shown on page 118 of our current catalogue.

CB Aerial

A CB aerial that meets the U.K. legal requirements. The aerial has a 1.5m long stainless steel rod and a loading coil at the base. The unit is supplied with a ball mount, connector and a 5m lead terminated with a PL259 plug.

Order As XG13P (1.5m CB Aerial)
Price £13.95

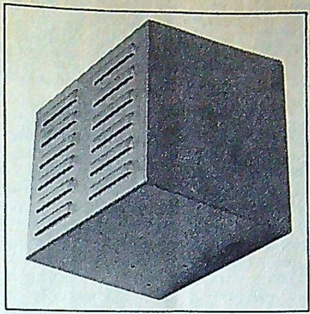
HOME SECURITY SYSTEM

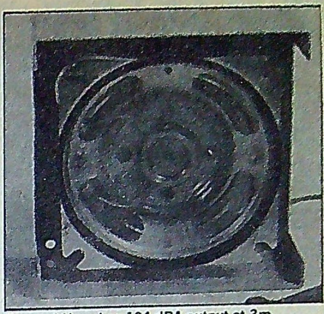
Continued from Page 46

external horns will sound along with LED 2. Turn the key switch to "dis-arm" and both horns should stop sounding. Note that the 12V external batteries supply the horn only, via TR2. When not in use, the current drain from B1 and B2 is approximately 5uA and will not effect the shelf life of the batteries greatly.

Using The System

Various systems for sensing and triggering the alarm unit are available and are listed in the parts list. Typical connections are shown in Figures 18, 19 and 20. Note that for maximum security only five switches, each with a 22k resistor, should be used per input (10 switches per module) and connected as in Figure 18(C). With 6 modules in use, up to 60 switches can be accommodated, using a two wire system, or 30 switches using the 4 wire system. Whatever method is favoured, refer to the break contact setting up procedure and adjust RV1 and RV2 on each module for half the supply voltage. Any form of shorting, bridging, reversing or cutting connections will trigger the alarm.


Wall mounted External Horn Box.


External Horn has 104 dBA output at 3m.

If one input only, per module, is to be used, terminate the remaining input with a 22k resistor (see Figure 16) otherwise the alarm will keep sounding, with that channel switched in.

Magnetic reed switches can be mounted into door frames and the magnet into the door directly opposite. Surface type reeds are available for metal frame works.

Pressure mats should be placed under carpets etc ensuring adequate clearance from furniture and metal foil strip can be fitted to glass panels. There will shortly be ultra sonic and microwave doppler detectors available and those will interface directly to the break contact module.

Finally, remember that setting the modules to half (+2.5V) supply rail will allow detection of short circuits or open circuits, within the contact loop so make or break contacts may be accommodated, using suitably placed 22k resistors. ■

AMENDMENTS TO CATALOGUE

Please amend your 1981 catalogue as follows:

Page 17/18
BW46A, 47B and 48C are replaced by the UP1300/W which is a wideband amp covering the whole UHF band. The new amp gives a typical gain of 13dB and a much improved noise figure of typically 2.5dB.
BW49D is replaced by the UP1300/V which has a typical gain of 19dB and a 2.5dB noise figure.
BW50E is replaced by the PU1240 which is electrically the same as the PU102, but is in a box like YQ22Y and has co-ax sockets for both sides of the aerial lead, instead of screw terminals, making connection simpler.

Page 20
Telescopic Aerial (LB10L) now only 4ft long and slightly thicker at base.

Page 22
Mains adaptor (YB22Y) and (XX09K) are now the same item and should be ordered as (XX09K). This new adaptor will deliver 300mA max and may be switched to any of the following voltages: 3V, 4.5V, 6V, 7.5V, 9V and 12V DC.

Page 38
Box PB1 Black (LH14Q) is now being supplied moulded in grey not black plastic.

Page 47
XY17T and XY18U are now being supplied in a smaller size. New size is 33 x 12in. (835 x 305mm).

Page 70
Electric pump XY74R is now supplied complete with a pressure gauge.
Suppressor capacitor HW02C is 1uF.

Page 93
Stereo headphone (LH85G) is now styled slightly differently from the one shown in the catalogue.

Page 104
5A Plug (HL57M) is bakelite and not nylon.

Page 107
Touch Dimmer (FQ14Q) is 250W (not 630W).

Page 115
Order codes for Slotted Nuts are WL43W (Collet Rd Nut ⅜in) and WL44X (Collet Rd Nut 10mm).
RX38R, Ebonite Rod is now being supplied in nylon.

Page 133
1mm light guide (XR56L) now being supplied with black protective sheath. Overall dia. 2.2mm.

Page 137
The spacesound units are now being supplied in slightly different sizes.

Page 154
BB67X (3600 VCF Mtg Bkt) should be included in the list under the heading "Mounting Brackets".

Page 182
Please note picture of stylus 29 is incorrect. The shaft is round not square. The picture of stylus 31 is also incorrect.

Page 184
Musicentre kit C113 (LX03D) is supplied with one bottle of fluid only.

Page 186
Cassette Splicer (YW90X) is now being supplied with one reel of splicing tape.

Page 201
QH55K (MJE2955) is now being supplied as TIP2955 and QH56L (MJE3055) as TIP3055. Please note V_{CBO} is now 100V, V_{EBO} is now 7V, I_C (max) is now 15A, and the pin-out is now style.P3c.

Page 229
In suggested PSU for LM383, the top end of the Std Res 100R should be connected to the collector of Q1 NOT the emitter.

Page 232
The pin-outs for the NE571 and TDA3410 are swapped over.

Page 235
The delay given by the TDA1022 is between 512us and 51.2ms and not as stated in line 2.

Page 243
In Parts List C11 is BX11M price 9p.

Page 245
The IC pin numbers in the right-hand drawing under the heading LM3911 are incorrect. The left-hand drawing is correct.

Page 255
The pin numbers on the IC package drawing under the heading L200 are in reverse order. They should be in sequence with 5 at the top and 1 at the bottom.

Page 258
QQ04E 6402 UART is now being supplied coded CDP1854ACE. These two parts are identical.

Page 266
Small Thermpath (HQ00A) is now supplied in 10g tubs.

Page 276
Dual rocker neon (YR70M) requires a panel cut-out 29 x 22mm.

Page 282
Footswitch (LB64U) is supplied with a 2.5mm plug fitted to the lead.

Page 299
Crimp tool (FY31J) is improved with an additional 1mm² stripper and crimpers for 1.5, 2.5, 4 and 6mm press terminals.

Page 301
Needle file set (YW63T) now contains only 10 files; there is one flat warding and one hand file, not two of each.

Page 319
The alphabetical order under S is incorrect. "Semiconductor Finder" should come after "Self-Tappers" and "Stand-offs" after "SRBP".

MAPLIN NEWS

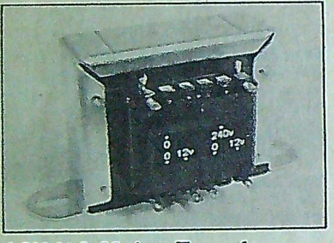
Click Switch

A neat, small and very low-cost push-switch in a matt black finish for direct PCB mounting. The switch has a smooth, gentle, but positive action with a clock-effect to let you know switch has operated. Action is single-pole push-to-make non-locking and one contact is connected to two pins, one on either side of the switch to ease PCB track layout.

Specification:

Contact rating:	10mA max.
Contact resistance:	<1Ω
Bounce:	<5ms
Life:	>2.5x10^5 operations
Key travel:	0.5mm
Size of button:	12.3x12.3mm
Height from PCB	11.5mm
Pin length:	3.5mm
Pin diameter:	0.8mm
Pin spacing:	10x4mm

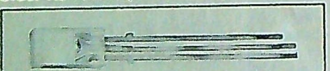
Order As HY34M (Click Key Black)
Price 24p



12V ½A Mains Transformer

A 240V mains transformer to complement the range shown on catalogue page 312. Conforms to BS415. The transformer has two secondaries 0 to 12V at 0.5A plus 0 to 12V at 0.5A. Total rating: 12VA. Overall size (wxdxl); 55x45x42mm.
Fixing centres: 70mm.

Order As YK28F (Tr 12V 0.5A) Price £4.25



Rectangular Multicolour LED

A single LED with three leads that can be made to emit light of any colour in the spectrum from green through to red. The LED is encapsulated in a rectangular 5 x 2.5mm package of clear resin.

Specification:

	Red	Green
Forward current	20mA	20mA
Forward voltage	2.2V	2.4V
Light intensity	2mcd	2mcd
Wavelength	630nm	560nm
Max forward current	30mA	30mA

Centre lead: Red and green cathode (-)
Outer long lead: Green anode (+)
Outer short lead: Red anode (+)

Order As QR54J (Rect Multicolour LED)
Price 75p

The Spectrum Synthesiser

A new monophonic, switch-linked, two oscillator synthesiser featuring advanced specification, constructional simplicity and low cost. Modulation, timbre control and interface facilities not found on any comparable synthesiser make it extremely powerful and versatile for keyboard playing, sound effects and many other home, stage or studio applications. Construction is simplified by the use of integrated circuits that each perform major synthesiser functions with few external components. The six CEM3300 series IC's are available from Digisound Ltd., 13 The Brooklands, Wrea Green, Preston, Lancs PR4 2NQ for £32.43 including VAT and P&P, but all the rest of the components for the Spectrum are now available from Maplin as a complete kit for just £167.50 including VAT and P&P! A book containing all the construction details, circuit descriptions etc. is also available from Maplin for just £1.

Order As XH56L (Spectrum Synth Book)
Price £1 *NV*
LW60Q (Spectrum Synth Kit) Price £167.50

Sheet-Metal Punch For Quick-Fit Meters

A punch for sheet metal up to 16swg mild steel, to suit our quick-fit panel meters. Punch is supplied with allen key and full instructions for use.

Order As RK20W (Punch 27.5mm)
Price £5.65

Quick-Fit Panel Meters

A new range of square-faced meters requiring just one round fixing hole to mount. A special punch is available to suit this meter and details are given below. The meter barrel is threaded and is tightened to a panel by a single large nut. A large PVC washer is also supplied to enable a tight fix without straining the plastic moulding. The front of the meter is a clear acrylic which may be unclipped.

Dimensions: 32 x 32mm face; overall depth 34mm; depth from back of front face 23mm.
Fixing hole required: 27.5mm diameter.
The following types are available:

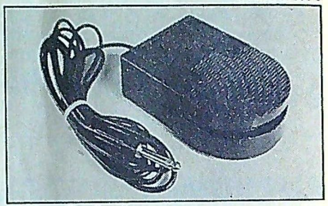
Full Scale Deflection	Internal Resistance	Type
50-0-50uA DC	2000Ω	Quick-fit Meter 50-0-50
100-0-100uA DC	1500Ω	Quick-fit Meter 100-0-100
50uA DC	4500Ω	Quick-fit Meter 50uA
100uA DC	2000Ω	Quick-fit Meter 100uA
500uA DC	400Ω	Quick-fit Meter 500uA
1mA DC	100Ω	Quick-fit Meter 1mA
5mA DC	10Ω	Quick-fit Meter 5mA
10mA DC	10Ω	Quick-fit Meter 10mA
50mA DC	10Ω	Quick-fit Meter 50mA
100mA DC	10Ω	Quick-fit Meter 100mA
500mA DC	10Ω	Quick-fit Meter 500mA
1A DC	10Ω	Quick-fit Meter 1A
5A DC	10Ω	Quick-fit Meter 5A
25V DC	100Ω	Quick-fit Meter 25V
50V DC	100Ω	Quick-fit Meter 50V
VU Meter	1500Ω	Quick-fit Meter VU

Order As
RK21X (Quick-fit Meter 50-0-50) Price £2.95
RK05F (Quick-fit Meter 100-0-100) Price £2.95
RK06G (Quick-fit Meter 50uA) Price £2.95
RK07H (Quick-fit Meter 100uA) Price £2.95
RK08J (Quick-fit Meter 500uA) Price £2.95
RK09K (Quick-fit Meter 1mA) Price £2.95
RK10L (Quick-fit Meter 5mA) Price £2.95
RK11M (Quick-fit Meter 10mA) Price £2.95
RK12N (Quick-fit Meter 50mA) Price £2.95
RK13P (Quick-fit Meter 100mA) Price £2.95
RK14Q (Quick-fit Meter 500mA) Price £2.95
RK15R (Quick-fit Meter 1A) Price £2.95
RK16S (Quick-fit Meter 5A) Price £2.95
RK17T (Quick-fit Meter 25V) Price £2.95
RK18U (Quick-fit Meter 50V) Price £2.95
RK19V (Quick-fit Meter VU) Price £2.95

Universal Ni-Cad Battery Charger

An attractively finished nickel-cadmium battery charger capable of charging up to one PP3 and any four AA, C or D cells or any combination of these simultaneously. A test position is provided for AA,C or D cells which gives an indication of current state of charge. Each of the five battery positions has its own LED "charge" indicator. The unit is housed in a black plastic moulding with a hinged clear plastic dust cover. Overall size: 210 x 100 x 50mm. Supplied with approx. 1.8m lead for connection to 240V AC mains and full instructions.

Order As YK31J (Universal Ni-Cad Charger)
Price £8.95



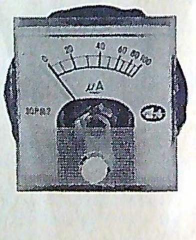
Foot Switch

A tough shatterproof ABS box with scratch resistant textured finish and non-slip rubber base pads. Large, easy-to-use foot-operated actuator has push-on, push-off action.

Specification:
Max voltage: 125V
Max current: 0.5A
Switch life: 100,000 operations
Contact resistance: 5MΩ

The box has a knock-out to fit an LED and a position to stick on a name or logo, and is supplied with 2.5m of single core screened lead terminated in a standard (¼in.) mono jack plug. Overall size: 121 x 82 x 46mm.

Order As YK26D (Pedal Switch Box)
Price £5.95



CLASSIFIED

MUSICAL FOR SALE

TRANSCENDENT 2000 synthesiser for sale, fully working. £250. Phone Ilminster (04605) 2950.

MAPLIN 3800 synthesiser fully assembled and tested. Includes Mike Beecher's "How to Play", and construction manual. Tel. (0429) 81264 after 6 p.m.

MAPLIN 4600 synthesiser in 5600 case. Excellent instrument with unlimited variation of sounds. Will accept £450 o.n.o. Mark Ingram, 70, Westwood Hill, East Kilbride, G75 8DW, Scotland.

LOWREY TEENIE Genie electronic organ and stool. Many voices including vibra-harp, Hawaiian guitar, mandolin etc. Very good condition. Bargain at £300 o.n.o. Tel. (09924) 62931.

UNUSED PARTS. Spring line XL08J £4, MES Driver XB85G £5; Keyboard XB15R with contacts £25. Or £30 the lot. N. Burroughs, Luton (0582) 598131, after 6 p.m.

SELLING DM02T and six SAM77, never used. E. Matthews, 63 The Oval, Otley, West Yorks, LS21 2EE.

JEN SX2000 synth, fair condition, £100. A. Cox, The Vicarage, South Petherwin, Launceston, Cornwall, PL15 7JA.

32-NOTE RCO pedal board with jacks, oscillator, tone forming and power units, keyer kit, all unassembled, offers. Parkins, 12, Moor Lane, Ponteland, Northumberland.

If you would like to place an advertisement in this section then here's your chance to tell Maplin's 120,000 customers what you want to buy or sell, absolutely free of charge. We will publish as many advertisements as we have space for. To give everyone a fair share of the limited space, we will print 30 words free of charge. Thereafter, the charge is 10p per word.

Please note that only private individuals will be permitted to advertise. Commercial or trade advertising is strictly prohibited in the Maplin Magazine.

Please print all advertisements in bold capital letters. Box numbers are available at £1.50 each. Please send your advertisement with any payment necessary to: Classifieds, Maplin Mag, PO Box 3, Rayleigh, Essex SS6 8LR. For the next issue your ad must be in our hands by 9th April 1982.

To reply to box numbers address your letter to: The Advertisement Manager (Box.........), Maplin Mag, P.O. Box 3, Rayleigh, Essex, SS6 8LR.

COMPUTERS FOR SALE

PET 2001, new ROMs 8K. Manuals, programs, TIS workbooks. Excellent condition, £290 o.n.o. Carrickfergus 66516 (Co. Antrim).

ZX81 SOFTWARE - 10 1K games on cassette - £2.50, listings 20p each, e.g. Canyon! (uses M/C), Destroyer, Galaxians, Shuttle, Holo, Lander. (16K coming soon, sae for details). C.W.O. to A. Laird, 9 Franklin Road, Saltcoats, Ayrshire, KA21 5AT.

TEXAS INSTRUMENTS home computer; advice, lists, debugs, bespoke programs, assistance of any kind. Please send sae to Stephen Shaw, 10 Alstone Road, Stockport, Cheshire SK4 5AH.

ZX81 + 16K RAM pack, Sinclair tapes, other taped software, books, PSU and all leads. £90. Tel. 01-455 1652 evenings only.

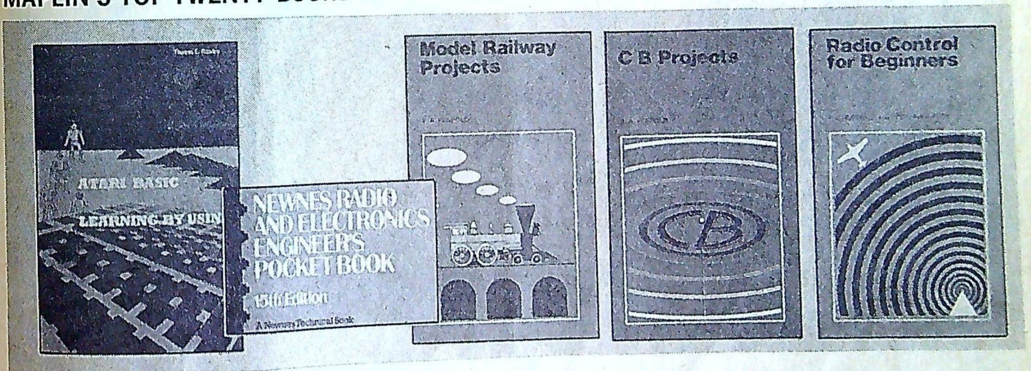
VARIOUS FOR SALE

ICOM IC260E 2m multimode transceiver with accessories, manual, 18 months old. Good, clean condition. £230. Andrew Stone, 01-399 0147 (term time only).

MABUCHI RS380 6V motors and variable resistor speed controllers. Ideal for Robots and other models. Both items ex. new equipment, £1.75 per item. D. Nicholls, 'Haulfre', Tan Lan, Ffynnongroew, Holywell, Clwyd.

P.E. VDU (built), additional IC's, TTL cookbook, £15. Reply to Box No. 1 (see note in column 2).

MAPLIN'S TOP TWENTY BOOKS



1. (-) Atari Basic Learning By Using by T. E. Rowley (WG55K) (See note).
2. (1) Z80 IC's Data Sheets (RQ54J) (Cat. P35).
3. (2) How To Make Walkie-Talkies by F. G. Rayer (RF18U) (Cat. P30).
4. (10) Adventures With Microelectronics by Tom Duncan (XW63T) (Cat. P24).
5. (-) Model Railway Projects by R. A. Penfold (WG60Q) (See note).
6. (6) IC555 Projects by E. A. Parr (LY04E) (Cat. P27).
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20. (19) Z80 Instruction Handbook by Nat Wadsworth (RL39N) (Cat. P36).

Note. For prices see page 37 of this magazine. Full details were published in issue 1.

These are our top twenty best-selling books based on mail-order and shop sales during November, December 1981 and January 1982. Our own publications and magazines are not included. We stock over 325 different books relating to electronics and the full range is shown in this magazine and on pages 23 to 37 of our 1981/2 catalogue.

MATINÉE ORGAN UPDATE

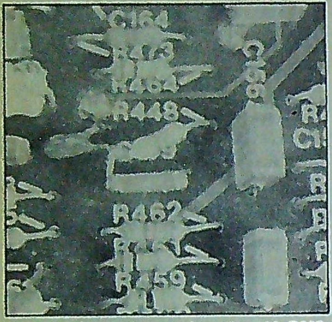

Figure 1. Connecting cap in series with R448. See note 5.

The Matinée help-line has been found very useful by constructors and at the same time we have been able to keep closely in touch with the kinds of problems experienced by constructors. If you are suffering from any of the following problems then here are the cures suggested by ourselves and other constructors. Page numbers refer to the construction book XH55K.

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1. If the delayed vibrato preset RV29 range is not very useful, change C126 to a 33uF 16V to give more control over the useful range.

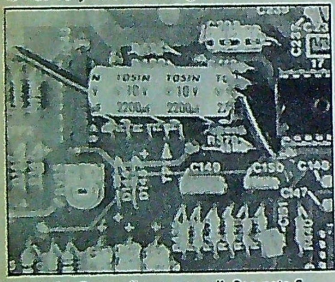

Figure 2. Decoupling power rail. See note 6.

2. If you are suffering from a click when S36 is operated, then fit a 0.1uF polyester capacitor between pins 1 and 2 of PL6.

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3. If the overall volume of the flute drawbars is too low then change R486 to 12k Min Res.

4. Some constructors feel that the cello sound is enhanced by making C159 a 12nF carbonate capacitor.

5. The setting of RV36 is sometimes affected by the position of the cello drawbar. If you have this problem, connect a 1uF 35V tantalum capacitor in series with R448. Lift the left-hand end of the resistor and connect the negative of the capacitor to it with the positive of the capacitor connected to the PCB as shown in Figure 1.

6. If background hum is noticeable, add a 2200uF, 10V axial with the positive end connected to the track pin near the legend "C213" and the negative end connected to the track pin near pin 1 of IC44 as shown in Figure 2.

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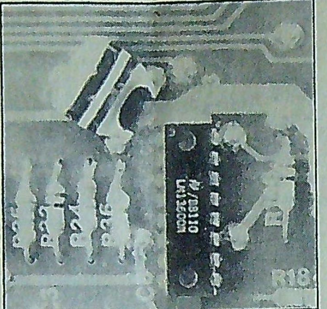

Figure 3. Reduction of interference from sampling clock on pedal wires. See note 8.

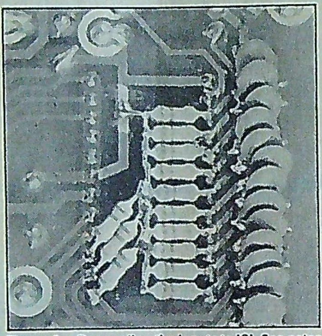

Figure 4. Decoupling the inputs to ICI. See notes 9 and 10.

7. If the harpsichord is too loud in relation to other preset stops then change R554 to a Min Res 4k7.

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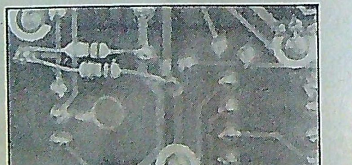
8. If you notice a background whistle when the pedals are pressed then connect a 0·1uF polyester capacitor to the track pin at the top of R36 and the track pin next above it to the right. See Figure 3.



Figures 5. Providing a discharge path for C11. See note 11.

9. If you hear an odd discordent rasping sound occasionally whilst playing the pedals then fit 13 Min Res 220k to pins 3 thru 15 of IC1 and join the other ends of the resistors together and connect them to the track going to pin 19 of IC1 by carefully scatching off the solder resist. See Figure 4.

10. If the pedal notes occasionally cut-off suddenly during sustain time, this is due to mains interference being picked up on the ribbon cable. To eliminate the problem, connect 13 minidisc capacitors 0.01uF to PL1 from pins 3 thru 15, to the track nearest the edge of the PCB by carefully scratching off the solder resist coating. See Figure 4.

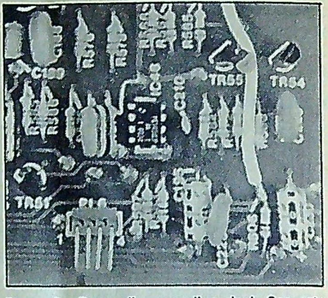


Figure 6. Decoupling sampling clock. See note 16.

11. If there is a residual rumble after the last note played when bass guitar operated then fit a Min Res 100k across C11 under the PCB and a Min Res 1M under the PCB, from the positive end of C11 to the track going to RV13 by carefully scratching off the solder resist. See Figure 5.

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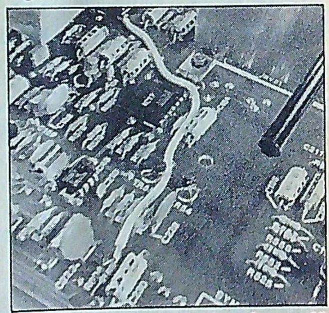

Figure 7. Reduction of mains hum. See note 18.

12. To increase the bass response of the organ change C31 to a 1uF 35V tantalum capacitor with the positive end connected to the end where the line is marked to the legend "C31".

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13. If the green LED is not as bright as the red, make R163 a Min Res 150R.

14. If a faint clicking is heard when the rhythms are running, but the rhythm volume is off then change C206 to an axial 2200uF 10V.

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15. If the bass drum is too loud make R285 a Min Res 120k. If the high bongo is too loud make R330 a Min Res 180k.

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16. If a very high frequency whistle is apparent at all times then connect a 0.1uF polyester capacitor between the track pin near pin 1 of IC46 and the track pin near pin 4 of IC46. See Figure 6.

17. If the pedals are too loud in relation to the rest of the organ change R572 to a Min Res 470k.

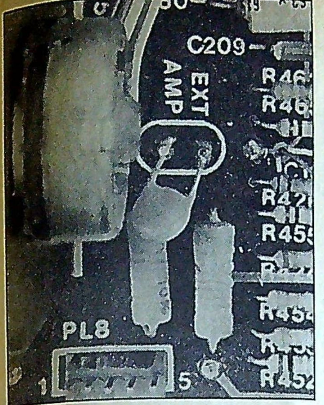

Figure 8. Reduction of illegal AM CB interference. See note 21.

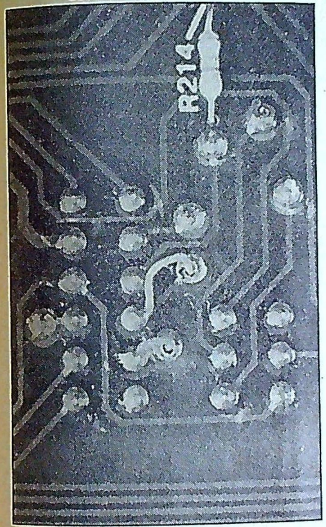

Figure 9. Connections to S24b. See note 22.

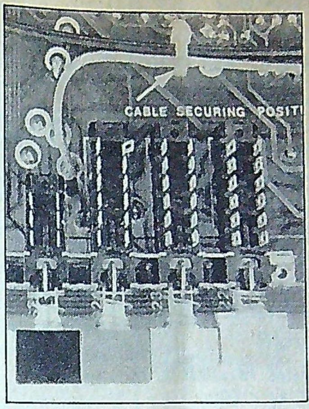

Figure 10. Underside of part of pcb shown in Figure 9. See note 22.

18. If after making change described in note 16 there is a noticeable mains hum, connect a piece of wire between the end of R606 farthest from edge of PCB and the track pin close to the right-hand front corner of RV44. See Figure 7.

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19. If distortion is heard on peak signals through the reverb then change C225 to a 0.047uF polyester capacitor.

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20. If you feel the rotor sound needs improvement at high frequency then change C69 to a 10nF ceramic capacitor.

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21. If you are suffering from interference from illegal AM CB connect a 470pF ceramic capacitor across the pins marked "Ext. Amp". See Figure 8.

General

22. If a high frequency whistle increases in volume when rhythm drawbar is advanced and S24 (auto accompaniment) pressed then proceed as follows. First remove the two track pins which connect to pins 2 and 3 of S24b, and enlarge the holes if necessary so that you can pass through from the underside the two unstripped centre wires of a 1m length of "Lapped Pair" as shown in Figure 9. Connect the red wire to pin 2 and the blue wire to pin 3 of S24b. On the underside of the PCB cut back the screen and insulate it. See Figure 10.

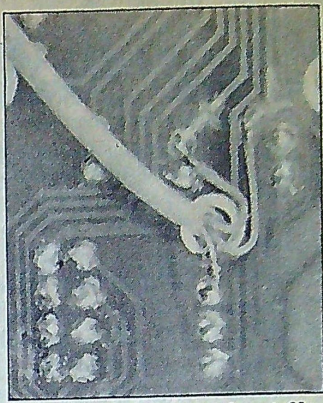

Figure 12. IC4 end of cable run. See note 22.

Run the cable as shown in Figure 11. At the other end cut the track by scratching it away with a small screwdriver or sharp point close to the point where D83 and D84 are joined. Also cut the track which leads to pin 33 of IC4. Connect the red wire to the end of D83 or D84 closest to the cut track and the blue wire to the track between the cut and pin 33 of IC4 after carefully scratching off the solder resist. Connect the screen to the track pin marked by the white circle near D83 and D84. See Figure 12.

23. If you wish to run the Matinée into an external amp, hi-fi system or tape recorder then proceed as follows. Connect a Min Res 4k7 at the headphone socket to the wire coming from pin 1 on SK9 and a Min Res 47k to the wire coming from pin 2 on SK9. Connect the other ends of the resistors together, then connect the centre conductor of a piece of screened cable to the point where the two resistors join and the screen to the other end of the 4k7 resistor. Connect the other end of the cable to the radio, tape or aux input of a hi-fi amp. If the signal is too loud, reduce the value of the 4k7 and if too soft, increase the value. ■

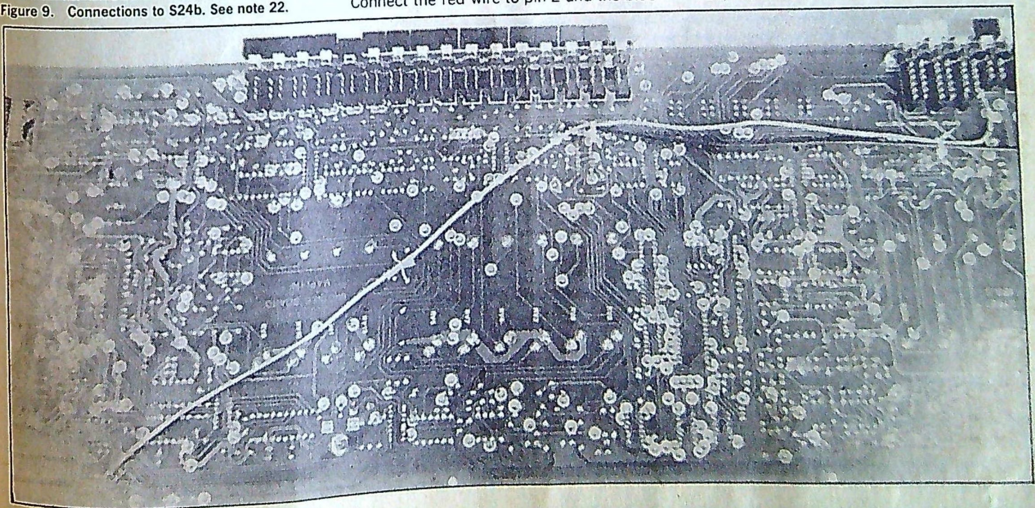

Figure 11. Cable run. See note 22.

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CORRIGENDA

We regret that the following errors occurred in issue 1 of the Maplin Magazine:

Page 9. In the Combo Amp Parts List, the order code for C24 should be WW26D and the order code for the Combo Front Panel should be XG03D. Also the quantity of Cabinet Cloth required is 2m.

Page 23. In the Peak Level Indicator Parts List, IC1 is a CA3240E (WQ21X).

Page 64. The order code for the Verobloc Bracket should be HQ84F.

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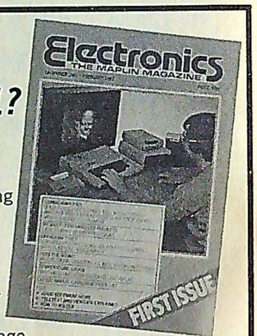

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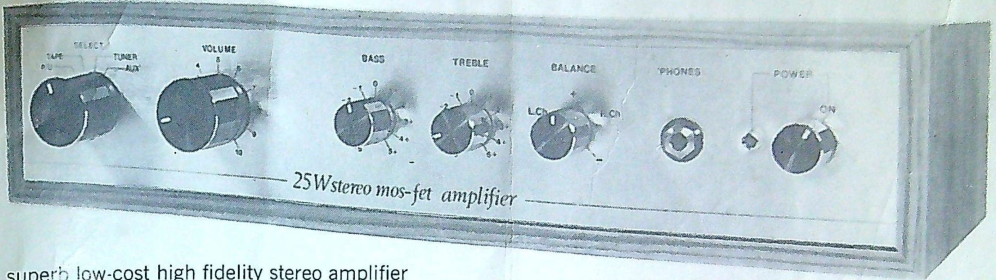

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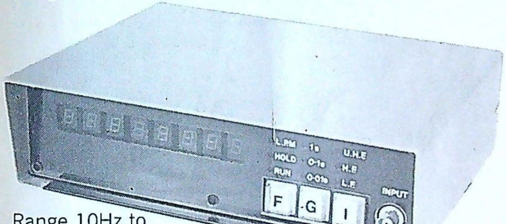

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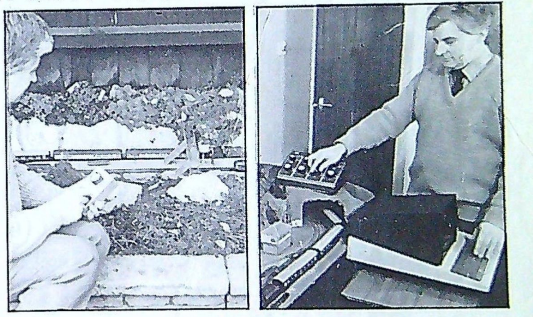

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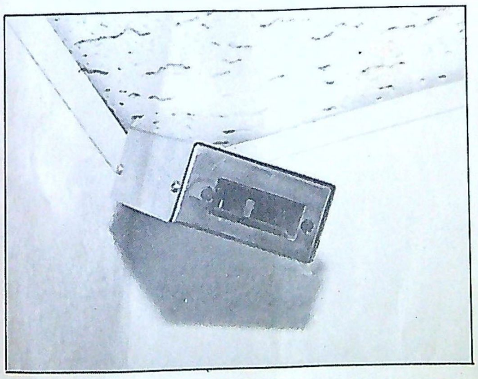

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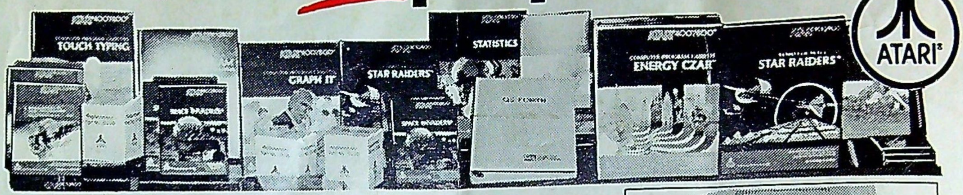

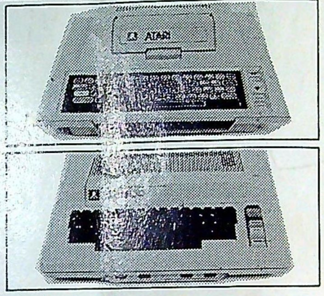

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